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Annex 1. The Baseline Monitoring Report

General Information

To undertake monitoring services for ambient air quality, noise, and water quality monitoring on Package 3 of the Obigarm - Nurobod Road Project has concluded a contract with the Analytical Laboratory of The committee for environmental protection under the Government of Tajikistan.

This report represents the results of the monitoring activities performed by the Analytical Laboratory team. The methodology and procedures follow international guidelines.

The monitoring took place on 29th December. 2022. The weather was medium. *+3* C.

ll the equipment was calibrated, cleaned, and tested for fieldwork

Table 1: GPS coordinates of the monitoring points

no	Monitoring Point Reference	Type Of Monitoring	E	N
1	W1	Surface water	70° 6'19.24"E	38°55'15.68"N
2	W2	Surface water	70° 6'18.08"E	38°54'55.52"N
3	A1	Air quality	70° 6'50.15"E	38°54'55.19"N
	N1	Noise		
4	A2	Air quality	70° 5'38.76"E	38°55'6.45"N
	N2	Noise		
5	S1	Soil	70° 6'27.11"E	38°55'9.73"N
6	S2	Soil	70° 6'50.15"E	38°54'55.19"N
7	S3	Soil	70° 5'38.76"E	38°55'6.45"N

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Figure 1: Monitoring Points

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Water Quality Monitoring

To supplement the baseline water quality information with the site-specific data for Package 3 the water samples will be taken from the Surkhob river in two locations upstream and downstream from the proposed bridge. The samples were not examined/analyzed at the location. Instead, were delivered to the laboratory of the Center for Analytical Control of the Committee for Environmental Protection under the Government of the Republic of Tajikistan in Dushanbe for analysis considering all the safety rules.

Water sampling methodology for Chemical and Biological analysis

Standard operating procedures (SOPs) for water sampling for chemical and biological analysis included the following steps:

1. Pre-sampling preparation: Ensure that all sampling equipment is clean and sterilized to prevent contamination. This may involve washing bottles, filters, and other equipment with distilled water or a suitable disinfectant.

2. Sample collection: Follow these general guidelines for sample collection:

a) Rinse sample containers thoroughly with the water to be sampled before collection to remove any contaminants.

b) Use sterile gloves to avoid introducing contaminants.

c) Use a clean and sterile container for each sample to avoid cross-contamination.

d) Collect the sample at the desired depth or location by submerging the container below the water surface. Middle deep for rivers – about 20 cm for Surkhob river

e) Fill the sample containers completely without any headspace to minimize air exposure.

f) Label each container with relevant information like date, time, location, and any specific parameters of interest.

3. Preservation and storage: The samples may need preservation to maintain their chemical integrity until analysis. Common preservation method include cooling the samples on ice to prevent microbial growth or degradation. Store the samples in coolers with ice packs during transportation to maintain their temperature.

4. Chain of custody: Maintain a proper chain of custody by documenting all relevant details such as who collected the samples, where and when they were collected, and who handled them during transportation and storage. This ensures traceability and integrity of the samples throughout the analysis process.

It is crucial to adhere to standard operating procedures (SOPs) specific to the analysis being performed, as different chemical analyses may have additional or unique sampling requirements. Additionally, following established guidelines and protocols, such as those provided by regulatory agencies or international standards organizations, helps ensure accurate and reliable results.

Samples were analyzed by standardized chemical and physicochemical methods:

- Drinking water. GOST - 2874-82.
- Drinking water, field analysis methods.
- GOST - 1030-81.
- BOD_5 - by the tetrameric method.
- Conductivity - on a conductivity meter manufactured in India.

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- Nitrates, nitrites, ammonium, chlorine - on a spectrophotometer.
- Weighted substances, solids, oil products were determined by the gravimetric method: on the analytical weight of Japanese production (Shimadzu)

Tile first sample of surface water, was taken from the Surkhob river 500m upstream of the proposed bridge. The weather was medium. +3°C. cloudy weather, weak wind.

Table 2: Results of Surface Water Sample (W1) with Permissible Norms

№	Name of Ingredients	MPC			Results W1
		Sanitary standards	Fishery water standards	Drinking water	
1	Temperature, °C	-			+4
2	pH	6,5-8,5		6,0-9,0	7,24
3	Odor	none			none
4	Transparency (cm)		—		1,6
5	Turbidity (mg/L)				254,1
6	Nitrites, (mg/L)	1,0 (3,3 - NO_2)	0,2	—	0,004
7	Nitrates, (mg/L)	10,2 (45 on NO_3	9,1	10,2 (45 on NO_3	1,43
8	Suspended solids, (mg/L)	25	75	25	187
9	BOD_5, (mg O_2/L)	3	3,0	3	1,8
10	COD, (mg/L)	—	30,0	—	4,6
11	Fluorides	1,5	0,75	1,5	0,002
12	Dissolved oxygen (mg O_2/L)	Not < 4.0			6,2
13	Oil products, (mg/L)	0,3	0,05	—	0,048
14	Iron (mg/L)	0,5	0,005	0,3	0,002
15	Copper (mg/L)	1,0	0,001	1,0	0,00
16	Chromium 6 valence (mg/L)	0,05	0,001	0,05	0,00

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Photo 1: Surface Water Quality Monitoring (W1)

5 ***Tile second sample of surface water***, was taken from the Surkhob river 500m downstream of the proposed bridge.

Table 3: Results of Surface Water Sample (W2) with Permissible Norms

№	Name of Ingredients	MPC			Results W2
		Sanitary standards	Fishery water standards	Drinking water	
1	Temperature, °C	-			4
2	pH	6,5-8,5		6,0-9,0	7,21
3	Odor	none			none
4	Transparency (cm)		—		1,6
5	Turbidity (mg/L)				254,6
6	Nitrites, (mg/L)	1,0 (3,3 - NO_2)	0,2	—	0,002
7	Nitrates, (mg/L)	10,2 (45 on NO_3	9,1	10,2 (45 on NO_3	1,21
8	Suspended solids, (mg/L)	25	75	25	192

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9	BOD_5, (mg O_2/L)	3	3,0	3	1,7
10	COD, (mg/L)	—	30,0	—	4,6
11	Fluorides	1,5	0,75	1,5	0,002
12	Dissolved oxygen (mg O_2/L)	Not < 4.0			6,4
13	Oil products, (mg/L)	0,3	0,05	—	0,046
14	Iron (mg/L)	0,5	0,005	0,3	0,002
15	Copper (mg/L)	1,0	0,001	1,0	0,00
16	Chromium 6 valence (mg/L)	0,05	0,001	0,05	0,00

Photo 2: Surface Water Quality Monitoring (W2)

Conclusions

During the water monitoring conducted on December 29, 2022, exceedance of the maximum allowable concentration was observed in Suspended solids in W1 sample (upstream of the proposed bridge) – 2,4 times and in W2 sample (downstream of the proposed bridge) – 2,5 times. The excess of suspended particles is associated with upstream precipitation (mineral

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suspension) and with the seasonal of biomass mortality. Long-term observation shows the trouble of the Surkhob river and its tributaries by suspended solids is seasonal especially during the flood period.

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Air Quality Monitoring

For the purpose of Package 3 ESIA to supplement the available data the ESIA Consultant conducted the air quality measurements in two locations at the edge parts of the AOI in the closest location to the sensitive areas. In order to evaluate dust particle concentration in the air, used Gas analyzer GANK – 4, which also includes PM10, PM2.5 sensor. The specific sensor is calibrated and tested for its accuracy and precision. CO concentration was also evaluated using GANK – 4, with specific CO sensor, which is also calibrated and tested.

Air quality measurement standard methodology

Standard operating procedures for air quality analysis with a mobile gas analyzer typically include the following steps:

1. Preparing the equipment: Ensure that the mobile gas analyzer is properly calibrated and functioning correctly. This may involve performing routine maintenance checks, such as cleaning the sensors and replacing any worn-out parts.

2. Safety measures: Take necessary safety precautions before starting the analysis. This may include wearing personal protective equipment (PPE) like gloves and masks, especially in areas with potentially hazardous air pollutants.

3. Setting up the analyzer: Install the mobile gas analyzer in a suitable location at the site. Connect it to a power source if required, and ensure all necessary cables and connections are secure.

4. Data collection: Start the data collection process by activating the gas analyzer. Allow it to stabilize for a specific period, usually mentioned in the manufacturer's instructions, to ensure accurate readings. Repeat data collection every 3 hour for higher accuracy.

5. Recording measurements: Record the measurements provided by the gas analyzer for each measurement. This may include concentrations of different gases, temperature, humidity, and other relevant parameters.

6. Data analysis and reporting: Analyze the collected data to identify trends, patterns, and potential sources of air pollution. Generate reports summarizing the findings, including graphs, tables, and interpretations of the results. These reports can be used for regulatory compliance, research purposes, or to guide decision-making processes.

№	Name of Ingredients	Maximal Permitted Concentrations (PMC)	A1 Darband town,	A2 Safedchashma village
1	$PM_{2.5}$, mg/m^3	25	18	21
2	PM_{10}, mg/m^3	50	35	41
3	TSP, mg/m^3	0,15	0,0065	0,0082
4	CO, mg/m^3	5	0,287	0,351
5	CO_2, mg/m^3	3900	620	673
6	NO	0,4	0,00437	0,00391
7	NO_2	0,2	0,00152	0,00121

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8	SO_2	0,5	0,0273	0,0082

6 Conclusion: Instrumental measurements of air were not detected exceeding the MPC

Photo 3: Air quality measurement at point N1 in town Darband

Photo 4: Air quality measurement at point N2 near the village Safedchashma

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Noise monitoring

7 For the purpose of Package 3 ESIA to supplement the available data the ESIA Consultant conducted the noise measurements in two locations at the edge parts of the AOI in the closest location to the sensitive areas.

Noise measurement standard methodology

Standard operating procedures for noise measurement with a mobile noise meter includeв the following steps:

1. Preparing the equipment: Ensure that the mobile noise meter is calibrated and functioning properly. Check the battery level and make sure it is fully charged or has sufficient power to complete the measurement.

2. Setting up the mobile noise meter: Position the mobile noise meter at the desired measurement location. Ensure that it is mounted securely and at an appropriate height, typically at ear level or around 1.2-1.5 meters above the ground.

3. Configuring measurement parameters: Set the necessary parameters on the mobile noise meter, including the time-weighting (e.g., fast or slow), frequency weighting (e.g., A, C, or Z), and measurement range (e.g., 30-130 dB). These settings depend on the specific requirements of the measurement and any relevant regulations or standards.

4. Initiating the measurement: Start the measurement on the mobile noise meter and allow it to record data for the desired duration. For best accuracy the duration is an hour and repeat measurement every 3 hours.

5. Monitoring the measurement: During the measurement, ensure that the mobile noise meter remains undisturbed and that no external factors interfere with the accuracy of the readings. Monitor any potential sources of noise that may affect the measurement and take note of any significant events or changes.

6. Recording and documenting data: Once the measurement is complete, record and document all relevant data, including date, time, location, measurement parameters, and any additional observations or notes. This information is crucial for analysis, reporting, and comparison with regulatory limits or standards.

7 Analyzing the data: Use appropriate software or tools to analyze the recorded noise data. Calculate statistical parameters such as LAeq (equivalent continuous sound level), Lmax (maximum sound level), and Lmin (minimum sound level). Compare the results with applicable noise limits or guidelines to determine compliance or identify any potential issues.

8 The instrument used for measuring sound pressure levels – Sper scientific sound level meter. The sound level meter including microphone, windscreen as well as cable meet the requirements for a class 1 instrument according to IEC 61672-1.

9 In automatic mode 100 measurements were made within 1-hour, maximum levels are shown in the table below

Table 4: Results of noise monitoring

№	Name of Ingredients	MPC	N1 Darband town,	N2 Safedchashma village
1	Noise, dB	55	46,0	46,2

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10 Conclusion: Instrumental measurements of noise were not detected exceeding the MPC.

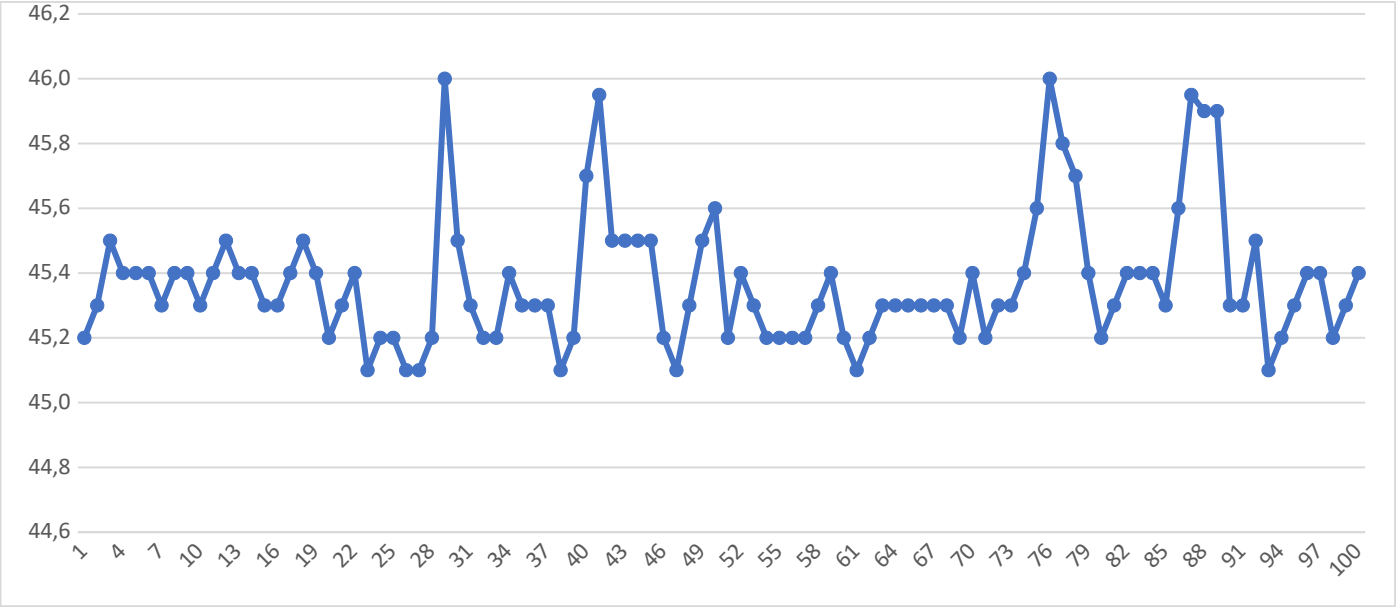

Figure 2: Measurements taken at point N1 in the town of Darband in the vicinity of the proposed construction site

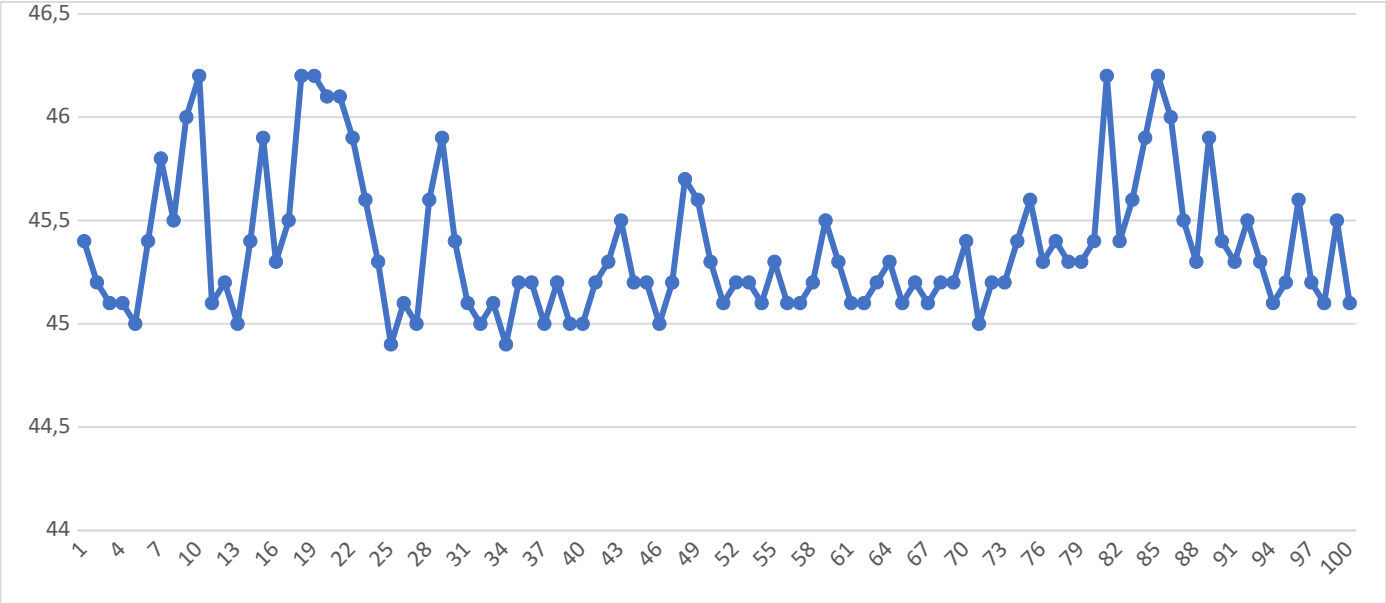

Figure 3: Measurements taken at point N2 near the village of Safedchashma in the vicinity of the proposed construction site

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Soil quality monitoring

10 As part of baseline studies, the samples will be taken from the soil and river sediments within the AOI.

Soil sampling methodology

Standard operating procedures for soil sampling for analysis typically include the following steps:

1. Equipment Preparation: Ensure that all necessary equipment is clean and in good working condition. This may include soil augers, shovels, sampling bags, gloves, labels, and GPS devices.

2. Sampling Depth: Determine the appropriate sampling depth based on the objective of the analysis. Common depths include 0-15 cm for surface soil.

3. Sample Collection: Use a soil auger or shovel to collect soil samples from the predetermined depth. Take multiple subsamples from each location to create a composite sample that represents the entire area. Avoid areas with obvious contamination or atypical soil conditions.

4. Sample Handling: Place each subsample into a clean sampling bag or container, ensuring that there is no cross-contamination between samples. Label each sample with a unique identifier, including the location, date, and any other relevant information.

5. Sample Storage and Transportation: Store the samples in a cool, dry place until they can be transported to the laboratory for analysis. Minimize exposure to extreme temperatures or sunlight during transportation to maintain sample quality.

11 Laboratory analysis results shown in the table below.

No	Name of Ingredients	Unit	MPC	Sampling locations		
				S1 Darband, near construction site	S2 Darband, 800 m of construction site	S3 Near village Safedchashma
1	pH	—	6,0 – 9,0	8,12	8,25	7,90
2	Dry residue	%	—	0,592	0,487	0.538
3	Potassium chloride (K_2O)	mg/kg	360,0	0,012	0,013	0,021
4	Nitrates (NO_3)	mg/kg	130,0	0,076	0,071	0,042
5	Manganese	mg/kg	1500	0,265	0,237	0,175
6	Hydrocarbonates	mg/kg	—	12,1	11,4	9,4

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7	Sulfates	mg/kg	160	0,260	0,220	0,350
8	Iron (Fe)	mg/kg	—	0,036	0,033	0,039
9	Copper (Cu)	mg/kg	3,0	0,004	0,006	0,001
10	Zinc (Zn)	mg/kg	23,0	0,265	0,237	0,098
11	Fluorine	mg/kg	10,0	0,761	0,724	0,489
12	Oil products in total	mg/kg	0,1	0,00	0,00	0,00

Conclusion: Instrumental measurements of soil were not detected exceeding the MPC. Почва по опасности загрязнения химическими неорганическими веществами относится к категории загрязнения почвы – «Чистая»

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Photo 5: Soil sampling

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КОМИТЕТ ПО ОХРАНЫ ОКРУЖАЮЩЕЙ СРЕДЫ ПРИ ПРАВИТЕЛЬСТВЕ РЕСПУБЛИКИ ТАДЖИКИСТАН
ЦЕНТР АНАЛИТИЧЕСКОГО КОНТРОЛЯ

П Р О Т О К О Л № 142

контрольных анализов проб воды

Объект Мониторинг река Сурхоб
Представитель Комитета *Худоёров Исмоил*
Представитель предприятия Дадабоев Дилшод
Дата отбора проб *«29» декабрь 2022 г.*
Дата проведения анализов *«30-06» январь 2023г.*

№	Наименования ингредиентов	ПДК			Проба № 1 Река Сурхоб 500 м выше объекта строительства	Проба № 2 Река Сурхоб 500 м ниже объекта строительства
		Санитарно-бытовые нормы	рыбо-хозяйственные	Вода питьевая		
1	2	3	4	5	6	7
1	Температура, ^{0}C	–	-	не более 20	4	4
2	Водородный показатель (pH)	6,5-8,5		6,0-9,0	7,24	7,21
3	Запах (баллы)	Не установлено		не более 2,0	отсутст	отсутст
4	Прозрачность (см)	Не установлено	Не установлено	не менее 30	1,6	1,6
5	Мутность, (мг/л)	Не установлено	Не установлено	не более 2,0	254,1	254,6
6	Нитриты, (мг/л)	1,0(3,3по NO_2)	0,02	-	0,004	0,002
7	Нитраты, (мг/л)	10,2(45по NO_3)	9,1	10,2(45по NO_3)	1,43	1,21
8	Взвешенные вещества, (мг/л)	25	75	25	187	192
9	$БПК_5$, (мг О/л)	3,0	3,0	3,0	1,8	1,7
10	ХПК. (мг/л).	-	30,0	-	4,6	4,6
11	Фториды, (мг/л)	1,5	0,75	1,5	0,002	0,002
12	Растворенный кислород, (мг О/л)	Не< 4,0			6,2	6,4
13	Нефтепродукты, (мг/л)	0,3	0,05	-	0,048	0,046
14	Железо, (мг/л)	0,5	0,005	0,3	0,002	0,002
15	Медь, (мг/л)	1,0	0,001	1,0	0,00	0,00
16	Хром 6-ти валентный, (мг/л)	0,05	0,001	0,05	0,00	0,00

Заключение: Превышение норм ПДК (рыбо-хозяйственные нормы) обнаружено, проба №-1 взвешенные вещества в 2,4-раза. Проба №-2 взвешенные вещества в 2,5-раза.

Начальник отдела Одинабеков Т.

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КОМИТЕТ ПО ОХРАНЫ ОКРУЖАЮЩЕЙ СРЕДЫ ПРИ ПРАВИТЕЛЬСТВЕ РЕСПУБЛИКИ ТАДЖИКИСТАН
ЦЕНТР АНАЛИТИЧЕСКОГО КОНТРОЛЯ

П Р О Т О К О Л № 126
контрольных анализов проб воздуха

Объект: Мониторинг атмосферного воздуха строящий объекта г.Дарбанд. район Нурабад.
Представитель Комитета: Худоёров Исмоил
Представитель предприятия: Дадабоев Дилшод
Дата отбора проб: «29» декабрь 2022 г.
Дата проведения анализов: «29» декабрь 2022г.

№	Точка отбор пробы.	Ингредиенты	Выбросы, концентрация		Объем расположения газов, пыл и сажа м³/ с
			ПДК м/раз	Фактический	
1)	Точка № 1. Гарадок Дарбанд около строящего объекта	CO	5,00	0,287	
		CO_2	3900	620	
		No	0,4	0,00437	
		No_2	0,2	0,00152	
		SO_2	0,5	0,0273	
		Пыль(TSP)	0,15	0,0065	
		PM 2,5	25 мкг/м³	18,0	
		PM 10	50 мкг/м³	35,0	
		Шум.	45-55	46,0	
2)	Точка № 2. Кишлак Сафед-чашма около строящего объекта	CO	5,00	0,351	
		CO_2	3900	673	
		No	0,4	0,00391	
		No_2	0,2	0,00121	
		SO_2	0,5	0,0195	
		Пыль(TSP)	0,15	0,0082	
		PM 2,5	25 мкг/м³	21,0	
		PM 10	50 мкг/м³	41,0	
		Шум.	45-55	46,2	

МАРКАЗИ НАЗОРАТИ ТАҲЛИЛИЮ ТАШХИСӢ

Начальник отдела Худоёров И.

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КОМИТЕТ ПО ОХРАНЫ ОКРУЖАЮЩЕЙ СРЕДЫ ПРИ ПРАВИТЕЛЬСТВЕ РЕСПУБЛИКИ ТАДЖИКИСТАН

ЦЕНТР АНАЛИТИЧЕСКОГО КОНТРОЛЯ И АНАЛИЗА

П Р О Т О К О Л № 81

анализов проб почвы

Объект: Мониторинг почвы строящего объекта г. Дарбанд р. Нурабад

Представитель Комитета: Худоёров Исмоил

Представитель предприятия Дадабоев Дилшод

Дата отбора проб *«29» декабрь 2022 г.*

Дата проведения анализов *«30-09» январь 2023г.*

№ №	Ингредиенты	Единица измерения	Нормати в (ПДК, не более) мг/кг	Места отбора проб.		
				Город Дарбанд около строящего объекта №1	Город Дарбанд около 800м. от строящего объекта №2	Кишлак Сафед-чашма около строящего обекта№3
1	pH	Единица pH	6,0-9,0	8,12	8,25	7,90
2	Сухой остаток	%	-	0,592	0,487	0,538
3	Хлорид калия (по K_2O)	%	360,0	0,012	0,013	0,021
4	Нитраты (по NO_3)	%	130,0	0,076	0,071	0,042
5	Марганец	%	1500	0,265	0,237	0,175
6	Гидрокарбонаты	%	Не установлено	12,1	11,4	9,4
7	Сульфаты	%	160	0,260	0,220	0,350
8	Железо Fe	мг/кг	Не установлено	0,036	0,033	0,039
9	Медь Cu	мг/кг	3,0	0,004	0,006	0,001
10	Цинк Zn	мг/кг	23,0	0,265	0,237	0,098
11	Фтор	мг/кг	10,0	0,761	0,724	0,489
12	Нефтепродукты суммарно	мг/кг	0,1	0,00	0,00	0,00

Коэффициент опасности загрязнения химическими веществами по каждому определяемому веществу не превышает ПДК в соответствии с ГН 2.1.7.2041-06 «Предельно допустимые концентрации (ПДК) химических веществ в почве» и ГН 2.1.7.2511-09.

Заключение: согласно МУ 2.1.7.730-99 «Гигиеническая оценка качества почвы населенных мест» (п.6.3) почва по степени опасности загрязнения химическими неорганическими веществами относится к категории загрязнения почвы – **«Чистая».**

Начальник отдела: Худоёров И.Р.

МАРКАЗИ НАЗОРАТИ ТАҲЛИЛИЮ ТАШХИСӢ

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ҶУМҲУРИИ ТОҶИКИСТОН

МУАССИСАИ ДАВЛАТИИ
«МАРКАЗИ МИЛЛӢ ОИД БА АККРЕДИТАТСИЯ»

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АТТЕСТАТИ

АККРЕДИТАТСИЯИ ОЗМОИШГОҲ

Дар феҳристи давлатии системаи миллии аккредитатсияи Ҷумҳурии Тоҷикистон

аз «31» январи соли 2022

№ TJ 762.37100.02.010-2022
ба қайд гирифта шудааст.

то «31» январи 2024 эътибор дорад.

Аттестати мазкур тасдиқ мекунад,ки **Маркази назорати таҳлилию ташхисии Кумитаи ҳифзи муҳити зисти назди Ҳукумати Ҷумҳурии Тоҷикистон.**
номгӯи озмоишгоҳи санҷишӣ (марказ)

шаҳри Душанбе, кӯчаи Шамсӣ-5/1.
суроға

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Замима: Доираи аккредитатсия дар ҳаҷми **4-саҳифа**.

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Annex 2. Climate Assessment Report

CONSTRUCTION OF A 920M LONG BRIDGE UNDER OBIGARM - NUROBOD ROAD PROJECT

CLIMATE RISK AND ADAPTATION ASSESSMENT REPORT (DRAFT FINAL)

Submitted to:

Asian Infrastructure Investments Bank (AIIB)

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ABBREVIATIONS

AIIB	-	Asian Infrastructure Investment Bank
CRA	-	Climate Risk and Adaptation Assessment
NDC	-	National Determined Contribution
BB	-	Building Block
IPCC	-	Intergovernmental Panel on Climate Change
GFDDR	-	Global Facility For Disaster Risk Reduction
GLOF	-	Glacial Lake Outburst Flood
UNEP	-	United Nations Environment Program
SSP	-	Shared Socioeconomic Pathways

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EXECUTIVE SUMMARY

1. The Government of Tajikistan (GoT) has requested a loan of USD 55 million from the Asian Infrastructure Investment Bank (AIIB) to finance the construction of a 920m long bridge and its approaches in Nurobod District in the center of the Republican Subordination province of the Republic of Tajikistan. The proposed bridge is located in the complex mountainous conditions at the junction of the valleys of Surkhob (Vakhsh) and Obihingou Rivers and the adjoining valley of Sorbog River from the north, a major tributary of Surkhob River.

2. The transport infrastructure in Tajikistan is directly vulnerable to the impacts of climate change. Climate change is expected to manifest itself in Tajikistan in increased temperatures as well as increased precipitation intensities and extreme weather events, especially in spring and summer.

3. An initial physical climate risk screening was carried out for the project using the "AWARE FOR PROJECTS" web-based tool. The results of the screening indicated a high climate risk rating. As such, we herein conduct a detailed Climate Risk and Adaptation Assessment (CRA) for the project as per AIIB's Paris Alignment methodology.

4. In this CRA, we conducted a vulnerability assessment by assessing the sensitivity and exposure of the project to detected climate hazards. On the basis of the vulnerability analysis, we analyzed the probability and impact of the high vulnerable climate hazards to determine the risks. The following are the identified climate risks for the project.

- **Extreme Precipitation and Floods.** Expected increase in extreme precipitation events is the most serious threat. This may not only lead to higher extreme discharges (i.e. flash floods) but can also lead to more frequent and powerful mudflows, landslides, and avalanches. These may pose additional risk for bridge foundations and drainage systems by discharge levels and solid loads exceeding the systems' design capacity. Similarly, an increase in extreme snowfall events may lead to an increase in the frequency of avalanches. Increases in precipitation extremes is also likely to increase the frequency of landslides and rockfall, upstream of the bridge location.
- **High Temperature and Heatwaves.** The substantial projected increase in air temperatures as well as annual number of days where daily maximum temperature exceeds 30°C, indicates that heat waves are more likely to occur

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and may last longer. This poses potential increased risks related to asphalt pavement integrity and thermal expansion of bridge expansion joints and paved surfaces. The current hazard level for wildfire in the project area is medium to high, but since the bridge is located in an area which has sparsely distributed vegetation the risk to the bridge is relatively minor. The risk of mudflows may also increase as their occurrence can be linked to deforestation by wildfire and increasing precipitation extremes.

5. Considering the risks to the project components, we identified the adaptation measures to mitigate the impact posed by climate change on project components. We further categorized these adaptation measures as Prioritized and Advisable. These measures include:

- **Prioritized Adaptation Measures:** (i) Use of waterproof membrane for bridge deck, (ii) Increased reinforcement in bridge piers, (iii) Providing more stiffness to the bridge girders, (iv) Increasing of Riprap installation at bridge piers, (v) Regular inspection and maintenance of the pier, (vi) Increased drainage system capacity for bridge pavement, (vii) Slope stabilization measures, river bank protection works, bio-engineering works along the slopes, and (vii)Sub-surface drainage in abutments.
- **Advisable Adaptation Measure:** Use of more expansion Joints in bridge pavement.

6. We estimated the climate adaptation finance with consideration of information available in the project documents including the project feasibility study, preliminary engineering design, and Environment Impact Assessment reports. We applied an incremental approach to estimate the cost of the identified adaptation measures. As a result, the tentative cost of climate adaptation for the project was estimated to be in the range of USD 2.49 to 2.73 million.

7. We assessed the project for its potential inconsistency to key national policies and strategies of Tajikistan as per AIIB requirements for Paris Agreement Alignment. These policies include Tajikistan's (a) Intended Nationally Determined Contribution (NDC) 2021, (b) National Action Plan for Climate Change Mitigation (c) National Strategy for Adaptation to Climate Change, and (d) National Disaster Risk Reduction Strategy. It is concluded that the project was aligned with Tajikistan's national climate adaptation and resilience policies and strategies.

8. Based on the assessment in the report, it can be concluded that the project is in full compliance with climate adaptation and resilience goals (BB2 assessment)

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of the Paris Agreement Alignment of AIIB criteria, provided that the suggested adaptation measures for climate resilience are included in the project design.

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I. PROJECT BACKGROUND

9. The Government of Tajikistan (GoT) through its Project Implementation Unit for Roads Rehabilitation (PIURR) under the Ministry of Transport (MOT), is implementing the project of construction of the 75-kilometer (km) long Obigarm-Nurobod Road to replace the existing section of M41 highway that will be inundated by the reservoir of the Rogun Hydropower Project (HPP). Following the impoundment of the dam, the reservoir is being filled and in time it will cover the existing M-41 road that runs from Dushanbe to the border with the Kyrgyzstan Republic at Karamyk. The Obigarm-Nurobod Road project is divided into three packages:

(i) **Package 1**: The Obigarm-Tagikamar section is about 30 km long. It includes two tunnels of 1.6 km and 1.7 km, four new bridges constructions and two bridges rehabilitations, and local access roads of approximately 30km;

(ii) **Package 2**: The Tagikamar-Nurobod section is about 44 km long. It includes 1 tunnel of 2.6 km, six new bridges construction, one bridge rehabilitation, in addition to one long temporary bridge, and local access roads of approximately 40 km; and

(iii) **Package 3**: includes a permanent bridge that is approximately 920 m long, and its approaches.

10. Package 1 and Package 2 are funded by ADB and ERBD respectively and are under the implementation stage. Package 3 is funded by Asian Investment Infrastructure Bank (AIIB) and currently under the Feasibility Study (FS) and Preliminary Design (PD) phase. This Climate Risk and Adaptation Assessment (CRA) has been prepared for Package 3 of Obigarm-Nurobod Road which covers a 920 m long permanent bridge and its approaches.

11. Districts under Tajikistan Central Government Jurisdiction are termed as Districts of Republican Subordination or Districts under Republic(an) Subordination. The project area is located at the edge of Nurobod District, in the center of Republican Subordination province of the Republic of Tajikistan.

12. The proposed project as Package 3 of the boarder road corridor represents a pre-stressed Concrete Box Girder Bridge in length of about 920m and approaches roads from the sides in total length of about 380m. The bridge area is located in the complex mountainous conditions at the junction of the valleys of Surkhob

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(Vakhsh) and Obihingou Rivers and the adjoining valley of Sorbog River from the north, a major tributary of Surkhob River.

13. The bridge supports are supposed to be built on pile foundations. The bridge will be built across the reservoir of Rogun HPP to connect the end of the Package 2 road section with the village of Darband, the center of the Nurobod district, which in the future will be located on the bank of the HPP reservoir. The salient features of the proposed bridge and its approaches is presented in Table 1 and the location of the project bridge is shown in Figure 1.

Table 5. **Salient features of the Bridge**

Parameter	Unit	Definition
Type		Pre-stressed Concrete Box Girder Bridge
Construction Method		Free Cantilever Method (FCM)
Length	m	920
Total Number of Piers	no	6 plus 2 abutment piers
Average height of piers	m	67
Span Length	m	85+ 5X150+85=920
Number of slabs	no	6
Width of the bridge	m	15.5 (Two lanes)
Design life	Years	100

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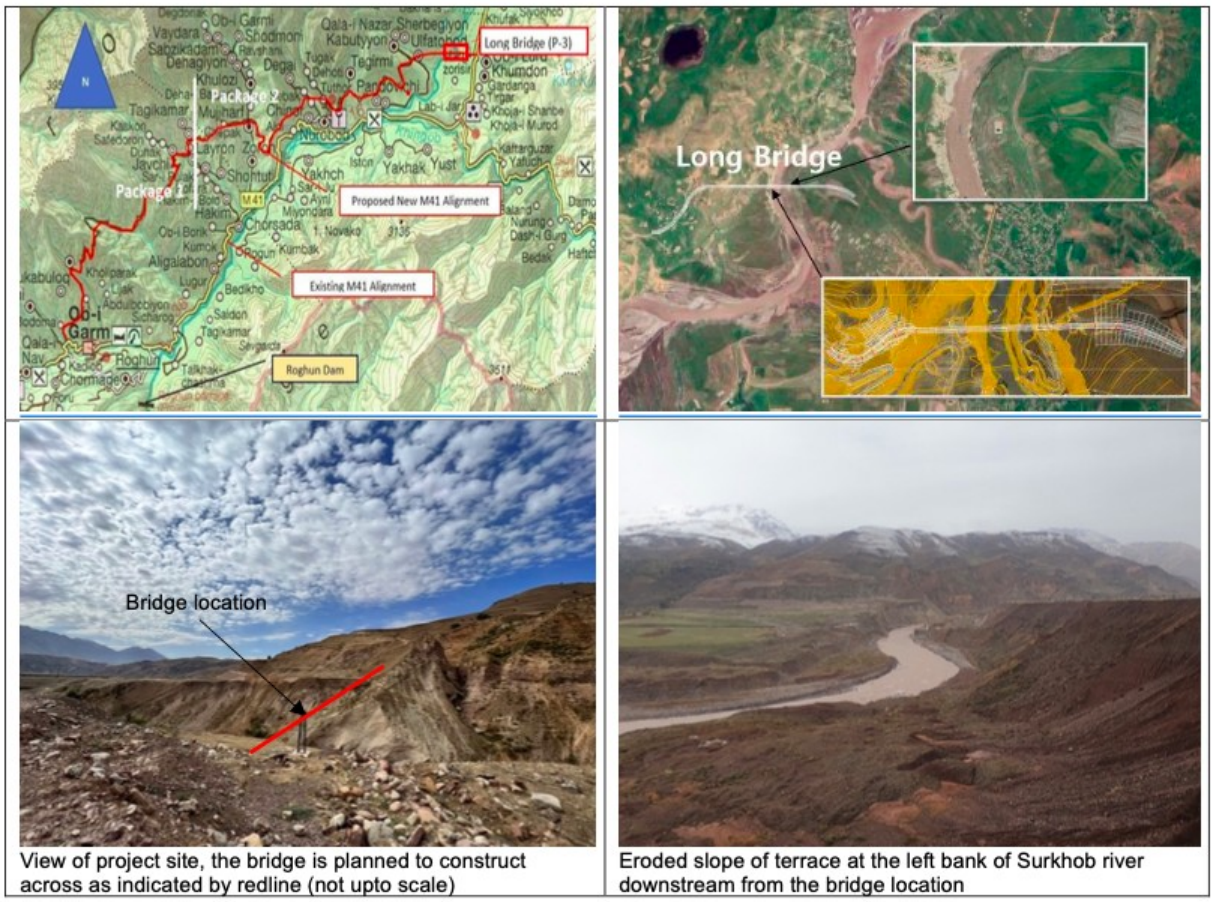

Figure 4: Project Location Map

14. Tajikistan is a landlocked country located in Central Asia, and it is known for its diverse topography and climate. Tajikistan, like many other countries, is experiencing the impacts of climate change and considered highly vulnerable to climate and disaster risks due to its geographical and socio-economic factors. The majority of Tajikistan's territory is covered by mountains, including the Pamir and Alay ranges. This rugged terrain makes the country susceptible to various natural hazards, such as landslides, avalanches, and glacial lake outburst floods (GLOFs). Climate change is exacerbating these risks by accelerating glacial melt and potentially increasing the frequency and intensity of these events. To minimize these climate-related risks, we conduct this CRA to identify appropriate adaptation measures to enhance climate resilience of project outputs.

15. The Project is expected to contribute to accomplishing the goals prioritized by the Nurobod district authorities: enhancing the quality of transportation and communication services, and improving the welfare of local dwellers.

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II. CLIMATE RISK AND VULNERABILITY CONTEXT OF PROJECT

16. Tajikistan is also prone to natural disasters, with floods, avalanches, mudflows, and landslides, and they cause not only traffic disruption but also significant economic loss. These disasters, resulting from high seasonal precipitation and annual snowmelt, are further exacerbated by the steep topography and related high runoff speeds and slope instability. Over 500 km of the roads under the MOT's jurisdiction are exposed to such adverse natural events. Natural events weaken roads and their associated infrastructure such as bridges, drainage systems, and other supporting structures, causing significant damages and making them impassable and/or unsafe. Another concern is the changes in flows of rivers and groundwater.[1]

17. The transport infrastructure in Tajikistan is directly vulnerable to the impacts of climate change. Climate change is expected to manifest itself in Tajikistan in increased temperatures as well as increased precipitation intensities and extreme weather events, especially in spring and summer[2].

18. **Boundaries:** The project area is located at the edge of Nurobod district, in the center of Republican Subordination province of the Republic of Tajikistan. District as well as provincial level data is considered for establishing historical climate change trends in the project area. For establishing future climate change projections, provincial level data is considered in this study.

19. **Scope:** The scope of work covers the following:

- Conduct a detailed climate risk and adaptation assessment (CRA) of the main climate and geophysical hazards as identified through the initial physical climate risk screening on relevant components of the proposed project;
- Carry out an assessment of the proposed project and its alignment with adaptation and climate resilience goals of the Paris Agreement on Climate Change following the AIIB Paris Alignment methodology;
- Recommend structural and non-structural adaptation measures to be considered in project design to manage these risks, with cost estimates;

[1] Asian Development Bank. Philippines. 2021.Tajikistan Transport Sector Assessment.
[2] Tajikistan: Poverty in the Context of Climate Change, 2012

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- Prepare a detailed CRA report, outlining main climate and geophysical hazards, their impact pathways, levels of certainty, and suitable adaptation measures.

20. **Methodology:** The CRA steps follow guidelines outlined by the AIIB Paris Agreement methodology on BB2 assessment[3]. Broadly, the steps followed were:

- Conducting a literature review of the vulnerability of critical project components to specific climate parameters. In any public service delivery infrastructure, performance and durability are critical. As such, we examined which climate parameters influence the infrastructures' performance and durability the most.

- Using historic and future Climate projections generated by the IPCC Sixth Assessment Report (AR6) and publicly available database, we assessed how the critical climate parameters are expected to vary in the long term future for 2090s (2080-2099) as the project design life is 100 years, relative to historic levels (1995–2014). We used 50th percentile multi-model mean ensembles and climatic datasets available at a grid resolution of 0.25^{o} X 0.25^{o} from the World Bank Climate Change Knowledge Portal (https://climateknowledgeportal.worldbank.org/). We considered three IPCC AR6 future climate scenarios for the CRA - SSP2-4.5 (intermediate GHG emission scenario), SSP3-7.0 (high GHG emission scenario) and SSP5-8.5 (very high GHG emission scenario). Details about historical climate change trends, future climate change projections, and these scenarios are presented in Appendix 1.

- Early in the planning stage, critical climate parameters to which the project's components are susceptible were identified. These parameters include temperature changes, precipitation changes, extreme weather events, cyclones, and droughts. Critical climate parameters posing a threat to the infrastructure were identified, their future changes were projected, as much as practically possible under expected climate change scenarios. Climate change projections were a challenge for this CRA due to the lack of reliable, incomplete and fragmented data. In such cases, a frequency analysis approach to calculate the probabilities of naturally occurring events, using historic data from utilities and line ministries, were used.

- The probabilities of occurrence of specific weather events, under the three SSP scenarios, were used, in part, to inform adaptation measures for each

[3] https://www.aiib.org/en/about-aiib/who-we-are/partnership/_download/Methodology-for-Assessing-the-Alignment-of-AIIB-Investment-Operations-with-the-Paris-Agreemement.pdf

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project subcomponent. where probability of occurrence of specific weather events and the incremental cost of adaptation enhancements will guide the decision-making process.

21. **Vulnerability Assessment:** Tajikistan is prone to many types of natural hazards, including floods, mudflows, landslides (mudslides), droughts (wildfires), earthquakes, snow avalanches, and wind storms. About 93% of the country's area is mountainous, which widely vary in height from several hundred meters to 6000-7000 meters above sea level.

22. **(i) Key Hazards in the Project Area:** As the climate continues to change, the significant hazards which are likely to impact the Project area in Tajikistan are[4]:

23. *Temperature (extreme high temperature) / heat stress - Higher temperature fluctuations*: The projected average temperature may also increase average moisture levels in the Project Area.

24. *Precipitation (intense) / avalanches, mudslides, landslides, rock falls, floods and mudflows*: Higher and more intense precipitation (torrential rains) and higher flows in rivers which may result in a greater risk of flash floods, and associated mudflows. This will also cause more intense erosion and a higher risk of mudslides and landslides, both in terms of their occurrence and harmful effects.

25. *Glaciers and snow / ongoing glacial melt, snow accumulation and melt (rapid snow melting may also cause landslides):* As winters are projected to be drier and summers wetter, this could result in increased floods in summer when the river flows are higher and droughts in winter, when river flows are lower.

26. *Wind*: Higher wind speed and gusts of wind, in particular around the new Rogun HPP Reservoir.

27. From a seismological point of view, the project road is located in the zone of 9-magnitude earthquakes on the Medvedev–Sponheuer–Karnik (MSK-64) scale. The region is seismically active and categorized as a very high seismic hazard zone of PGA > 0.4g. This seismic hazard is due to tectonic zones and is confirmed by a long history of earthquake events in the last centuries. Figure 2 presents the current natural hazard risks in the project area.

28. **(ii) Sensitivity Analysis of Project:** Sensitivity of project components to various hazards has been carried out using AIIB guidelines[3] and presented in Table 2 and 3.

[4] EIA, Obigarm–Nurobod Road Project, https://www.adb.org/sites/default/files/linked-documents/52042-001-eiaab.pdf

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Table 6: Levels of Sensitivity to Climate Change Impacts

Level of Sensitivity	Definition
Not Sensitive	No infrastructure service disruption or damage
Low Sensitivity	• Localized infrastructure service disruption; no permanent damage • Some minor restoration work required
Medium Sensitivity	• Widespread infrastructure damage and service disruption requiring moderate repairs • Partial damage to local infrastructure
High Sensitivity	• Permanent or extensive damage requiring extensive repair
Moderate or high sensitivity impacts are considered vulnerable	

Table 7: Sensitivity Analysis of Project

Hazard	Sensitivity Level	Remarks
Flash Floods/ Glacial Lake Outburst Flood (GLOF)	High	The bridge site is prone to floods. This could undermine serviceability of the bridge, leading to erosion and damage bridge foundation. Higher temperatures and snowmelt will result in higher water levels which will also affect scour rates.
Landslide	High	Steep slope present on right bank of river. Heavy rainfall events will likely increase the risk of slope failures in sections with steep slopes.
Earthquake	High	The bridge supports are based on concrete foundations which could be damaged during earthquakes due to soil liquefaction.
Mudflow	High	High mudflows can cause extensive damage to the structure, including concrete erosion, foundation damage, and bridge collapse.
Extreme Heat	Medium	An increase in extreme temperature could cause the surface material to disintegrate. Seasonal contrast in temperatures and intense rainfall events could also cause surface material to deteriorate faster. The temperature changes can cause the expansion and contraction of the bridge infrastructure leading to thermally induced stresses which can cause degradation.
Extreme Rainfall	Medium	An increase in the intensity and frequency of heavy rainfall events could block the drainage system of the roads. Due to higher precipitation, significantly higher average annual runoff is projected. Increase in scouring of bridge, and support structures due to increased runoff discharge.

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Hazard	Sensitivity Level	Remarks
Snowfall	Medium	Deterioration of pavement due to increase in freeze–thaw conditions When bridges are built on permanently frozen ground additional runoff from the melting permafrost due to climate change may also result in a higher scour risk
Avalanche	Medium	Snow avalanches resulting in higher flood level and higher scour rates
Drought	Medium	Drought combined with extreme heat increases wildfire risk
Extreme wind events	Medium	Bridge instability which is caused by high speed wind, usually involves vertical (bending) and torsional vibrations of the structure.

29. **iii) Exposure of Project to Hazards:** Exposure of project to various hazards has been carried out using AIIB guidelines[3] and presented in Table 4.

Table 8: Hazard Exposure of Project

Hazard	Exposure Level	Justification
Flash Floods/ GLOF	High	33 severe floods observed in Tajikistan between 1970 - 2021[10]. Flood of 180 cm - 720 cm is expected in project area due to increased intensity of extreme rainfall events and increased flow in Surkhob river.
Earthquake	High	The project area is exposed to 5-5.9 magnitude earthquake. Also there are historical evidences of number of earthquakes surrounding the project area. With the construction of Rougun Dam, the exposure of earthquakes is likely to increase.
Mudflow	High	Active physical weathering, sparse vegetation, intense rainfall activity and significant snow reserves upstream contribute to the formation of high flow maxima with solid content, causing a descent of mudflows.
Extreme Heat	Medium	Under SSP2-4.5 scenario, number of hot days relative to the baseline period value of 8 is projected to be increased by 9

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Hazard	Exposure Level	Justification
		days for 2090s whereas under SSP5-8.5 scenario, number of hot days relative to the baseline period value is projected to be reduced by 21 days for 2090s.
Extreme Rainfall	Medium	The maximum daily rainfall (Rx1) is projected to increase by 50%, 55% and 65% under SSP2-4.5, SSP3 -7.0 and SSP5-8.5 scenario respectively by 2100 with respect to baseline levels of 1995-2014.
Avalanche	Medium	Significant snowfall is prevalent from November to March, reaching the highest point in February with up to 856mm where the days of snowfall peak at an impressive 18.5 days[5].
Landslide	Medium	The average slope is 14 % with the maximal slope ranging from 64% on the right bank to 39% on the left bank. The vertical difference between the highest and lowest points is about 120m. Due to drying of river banks due to temperature rise there will be reduction in soil moisture content in the ridge surrounding it. Loose soil may trigger landslide issues at project site.
Drought	Low	Only two severe droughts observed in Tajikistan between 1970 - 2021[6].
Extreme wind events	Low	Only one cyclone observed in Tajikistan between 1970 - 2021[4].

30. **(iv) Vulnerability of Project to hazards:** Due to a combination of political, geographic, and social factors, Tajikistan is recognized as vulnerable to climate change impacts, ranked 98th out of 185 countries in the 2021 ND-GAIN Index[7]. Based on the sensitivity and exposure analysis carried out in the above sections, a vulnerability assessment has been carried out and presented in Table 5 below. The project area is highly exposed to flash floods due to upstream GLOFs, rainfall induced landslides and mudflows and is highly sensitive to these events as presented in the above sections. Thus the project area is highly vulnerable to these

[5] https://www.weather-atlas.com/en/tajikistan/obigarm-climate

[6] United Nations Economic and Social Commission for Asia and the Pacific. https://rrp.unescap.org/country-profile/tjk

[7] The ND-GAIN Index Score takes into account various factors, including a country's exposure to climate hazards, its sensitivity to those hazards, and its capacity to adapt and respond effectively to the challenges posed by climate change. The index uses a range of socioeconomic, environmental, and governance indicators to evaluate a country's climate readiness.

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hazards. The vulnerability to extreme rainfall events, extreme heat, snowfall, avalanches, droughts and extreme wind events is categorized as medium based on exposure and sensitivity analysis carried out for the project.

Table 9: Vulnerability Assessment of Project

Hazard	Sensitivity Level	Exposure Level	Vulnerability
Flash Floods/ GLOF	High	High	High
Landslide	High	High	High
Earthquake	High	High	High
Mudflow	High	High	High
Extreme Heat	Medium	Medium	Medium
Extreme Rainfall	Medium	Medium	Medium
Snowfall	Medium	Medium	Medium
Avalanche	Medium	Medium	Medium
Drought	Medium	Low	Medium
Extreme wind events	Medium	Low	Medium

31. **(v) Probability Analysis:** Probability analysis has been carried out based on the Global Facility for Disaster Risk Reduction Database[8] for the major hazards in the project area and is presented below:

- **Floods/ Extreme Rainfall**: Urban floods are expected to occur at least once in the next 10 years due to extreme rainfall events. For river floods, there is a chance of less than 1% that potentially damaging and life-threatening river floods occur in the coming 10 years (return period of c. 1 in 1000 years). Detailed flood risk assessment of Surkhob river at the bridge site is carried out and presented in Appendix 2.
- **Earthquake**: There is more than a 20% chance of potentially-damaging earthquake shaking in your project area in the next 50 years.

[8] https://thinkhazard.org/en/report/37617-tajikistan-tadzhikistan-territories-darbanskiy/FL

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- **Landslide**: This area has rainfall patterns, terrain slope, geology, soil, land cover and (potentially) earthquakes that make localized landslides a frequent hazard phenomenon.
- **Extreme Heat/Drought**: There is between a 5% and 25% chance that at least one period of prolonged exposure to extreme heat, resulting in heat stress, will occur in the next five years.

32. **(vi) Impact Analysis and Risk Assessment:** The transport infrastructure in Tajikistan is vulnerable to projected changes in climate variables. Foreseen changes in air temperature, precipitation, and associated extreme weather events can result in the following impacts on the project infrastructure:

Table 10: Potential impacts of climate change on Project infrastructure

Projected climate change	Impacts on Project Infrastructure
Increases in hot days and heat waves	• Deterioration of pavement integrity, such as softening, traffic-related rutting, and migration of liquid asphalt due to increase in temperature • Thermal expansion of bridge expansion joints and paved surfaces
Increases in temperature in very cold areas	• Changes in approach road subsidence and weakening of bridge supports due to thawing of permafrost • Reduced ice loading on structures such as bridges
Later onset of seasonal freeze and earlier onset of seasonal thaw	• Deterioration of pavement due to increase in freeze–thaw conditions
Increase in intense precipitation events	• Damage to drainage systems due to flooding • Increase in scouring of roads, bridges, and support structures • Damage to approach road infrastructure due to landslides

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	• Overloading of drainage systems • Deterioration of structural integrity of approach roads and bridges due to increase in soil moisture levels
Increases in drought conditions	• Damage to infrastructure due to increased susceptibility to wildfires • Damage to infrastructure from mudslides in areas deforested by wildfires

33. **Risk Assessment: (i) Flooding and Inundation:** Surkhob River is mainly fed by meltwater, and thus the maximum flow rate in the river is associated with the flood phase. Since rainwater plays an insignificant role in the total flow of Surkhob River, the maximum flow of water in the river is entirely formed by meltwater. Liquid precipitation also plays a relatively large role in feeding the river, creating a series of rainfall peaks in the spring that overlap the main flooding period. The projected increase in extreme precipitation events increases the potential risk of flooding of bridge infrastructure due to overloading of drainage systems. The projected increase in intensity of extreme precipitation events implies that this risk increases in the future.

34. **(ii) Landslide and Mudflow**: Mudflows are widespread and dangerous for their unpredictability and lack of methods for calculating glacial mudflows that are formed during the melting of glaciers. Active physical weathering, sparse vegetation, intense rainfall activity and significant snow reserves contribute to the formation of high flow maxima with solid content, causing descent of mudflows.

35. About 95 % of mudslides are caused by heavy rainfall or continuous rain. Typically precipitation above 15-20 mm per day in arid areas causes debris flows[9]. Melting snow does not generate significant mudslides, but melting snow adds to the rainfall effect and may cause small snowfield (snow patch) mudslides. In Tajikistan, valley parts and foothills mudflows typically occur in the spring. In the mountainous and highland regions, mudflows usually emerge in summer, when the snowmelt begins.

36. The precipitation maximum amount is observed in the winter-spring period and its almost complete absence - in August-September. The total annual

[9] https://www.osce.org/files/f/documents/1/7/408008.pdf

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precipitation is up to 936 mm (in the Nurobod Meteorological Station). The maximum daily rainfall at the Rasht Meteorological Station was recorded at 81 mm. The maximum daily rainfall is projected to increase by 50%, 55% and 65% under SSP2-4.5, SSP3-7.0 and SSP5-8.5 scenarios respectively by 2100 for 100-year return period rainfall event. The number of days with snow cover reaches up to 85 days. The earliest date of snow cover occurrence is on 27 October and the latest - on 1 January. The earliest date of snow cover melt is on 26 February and the latest - on 16 April. The average ten-day snow cover thickness is ranging from 2 cm in December to 52 cm in February. The maximum height of snow cover recorded at the Obigarm Meteorological Station is 114 cm.

37. It can reasonably be assumed that the projected increase in extreme precipitation events may increase the risk of mudflows. Potential later onset of seasonal freeze and earlier onset of seasonal thaw may lead to an increase in freeze–thaw conditions which could increase the risk and of slope instability and occurrence of landslides and/or rockfall due to weathering effects.

38. **(iii) Snow avalanches:** The major reason for avalanches in Tajikistan is fresh snow formation. Large amounts of fresh snow not yet consolidated, are likely to be set in motion. In addition, the interface between fresh and old snow is rather unstable and tends to create sliding planes. Most avalanches in Tajikistan are observed in February and March[10]. Projected increases in extreme precipitation events during cold weather conditions could result in extreme snowfall events which may lead to avalanching, especially if combined with warm spells, which are likely to increase under the projected climate change scenarios. The occurrence of heavy snow and avalanches will likely increase considering the projections of increases in extreme precipitation and higher minimum daily temperatures.

39. **(iv) Heatwave, Drought, Wildfire:** The substantial projected increase in air temperatures as well as annual number of days where daily maximum temperature exceeds 25 °C, indicates that heat waves are more likely to occur and may last longer. This poses potential increased risks related to asphalt pavement integrity and thermal expansion of bridge expansion joints and paved surfaces. The current hazard level for wildfire in the project area is minor as the bridge location is not heavily forested.

Considering the type of climate hazards and risks in the project area, and the area-specific climate change projections, the most serious threat comes from the expected increase in extreme precipitation events. This may not only lead to higher extreme

[10] ADRC. (2006). Tajikistan. Country Report. Asian Disaster Reduction Center.

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discharges (i.e. flash floods) but can also lead to more frequent and more powerful mudflows, landslides, and avalanches. These may pose additional risk for bridge foundations and drainage systems (i.e. culverts) by discharge levels and solid loads exceeding the systems' design capacity. Similarly, an increase in extreme snowfall events may lead to an increase in the frequency of avalanches. Increases in precipitation extremes is also likely to increase the frequency of landslides and rockfall, upstream of the bridge location.

III. CLIMATE ADAPTATION AND RESILIENCE MEASURES

40. **Current Design and additional measures requirement:** The project components are designed to withstand an average daily surface temperature of 40ºC. The average annual air temperature in the project area varies from 9.9°C (the Obigarm Station) to 11.2°C (the Nurobod Station). The coldest month is January with the average monthly temperature at the Obigarm, Rasht Stations - 4.6°C, and at the Nurobod Station - 4.1°C. The warmest months are July-August, with the average monthly temperature of 24.8°C in August (the Nurobod Station). Absolute minimum temperatures are in January and range from -30°C at the Nurobod Station to -32°C at the Rasht Station. The absolute maximum temperature in August is 40°C in Obigarm, Rasht and 41°C at the Nurobod Station.

41. The mean surface temperature is projected to increase by 3.01°C, 4.16°C and 5.93°C under SSP2-4.5, SSP3-7.0 and SSP5-8.5 scenarios respectively by 2100. The maximum surface temperature is projected to increase by 3.13°C, 4.4°C and 6.22°C under SSP2-4.5, SSP3-7.0 and SSP5-8.5 scenarios respectively by 2100. The frequency of extreme heat days is projected to increase in future scenarios. It is very likely that maximum temperature in the project area will exceed beyond 40°C as projected by the climate models. The average annual temperature will be below 40°C in the project area. So no additional adaptation measures are necessary in this regard.

42. The total annual precipitation in the project area is up to 936 mm (in the Nurobod Meteorological Station). The project components and drainage were designed for a maximum daily rainfall of 81 mm (recorded at Rasht Meteorological Station). The maximum daily rainfall is projected to increase by 50%, 55% and 65% under SSP2-4.5, SSP3-7.0 and SSP5-8.5 scenarios respectively by 2100 for 100 year return period rainfall event. So the project

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components and drainage should be designed considering at least 50% increase in daily maximum precipitation. Table 7 presents a summary of the summary of climate risks and possible adaptation measures for the project.

43. Concrete bridge deck deterioration is one of the most extensive bridge maintenance problems affecting service life. Moisture and chloride intrusion can accelerate concrete bridge deck distress. Waterproofing membranes, when applied properly, extend the life of the bridge decks delaying the need for rehabilitation. They do this by preventing the penetration of chloride ions and other corrosives that ultimately lead to deterioration of the reinforcing steel and concrete[11].

44. The climate adaptation finance is estimated based on available project documents including feasibility study, preliminary engineering design and Environment Impact Assessment reports. An incremental approach is used in estimation.

Table 11: Summary of Climate Risks and Possible Adaptation Measures for the Project

[11] https://vtrans.vermont.gov/sites/aot/files/planning/documents/research/publishedreports/2019-07_BDM.pdf

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Climate Change Hazard	Current Embedded Measures in Preliminary Design	Additional Adaptation Measure requirement	Possible Risks (Without Additional Adaptation Measures)	Additional Adaptation Measures for Risk Mitigation
Increase in precipitation The total annual precipitation in the project area is up to 936 mm (in the Nurobod Meteorological Station). The maximum daily rainfall recorded at Rasht meteorological station is 81 mm. The maximum daily rainfall is projected to increase by 50%, 55% and 65% under SSP2-4.5, SSP3-7.0 and SSP5-8.5 scenarios respectively by 2100 (Flood of 180 cm - 720 cm is expected in project area due to increased intensity of extreme rainfall events and increased flow in Surkhob river. Detailed flood risk assessment of Surkhob river at bridge	The project components and drainage were designed for maximum daily rainfall of 81 mm. ▪ Shortening the installation drainage spacing over the bridge deck with 6m interval. ▪ Increasing of Riprap installation to prevent scour. ▪ Increased bending capacity of piers	**Yes.** The project components and drainage should be designed considering at least 50% increase in daily maximum precipitation	▪ Accelerated material degradation ▪ Higher flood levels and more frequent flooding ▪ Damage to pavements ▪ Higher scour rates ▪ Insufficient capacity of drainage systems ▪ Higher risk of collapse settlement ▪ Less stable side slopes ▪ More frequent landslides ▪ Higher hydrostatic pressure behind abutments and retaining walls ▪ Higher risk of soil liquefaction	**Prioritized Measures:** ▪ Use of waterproofing membranes on bridge deck ▪ Use of partially grouted riprap, concrete block systems, gabion mattresses, grout-filled mattresses; Upstream walls and obstructions, collars, etc. ▪ Attenuator fence system and combined wire mesh and cable net drapery, soil berm to provide protection for piers ▪ Soil bioengineering, debris flow breakers, debris flow deflectors, etc. ▪ Improved monitoring and inspection of bridge **No Advisable Measures.**

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Climate Change Hazard	Current Embedded Measures in Preliminary Design	Additional Adaptation Measure requirement	Possible Risks (Without Additional Adaptation Measures)	Additional Adaptation Measures for Risk Mitigation
site is carried out and presented in appendix 2.)				
Higher temperatures/ Increase in solar radiation/ Higher carbon concentrations/ Changes in relative humidity The average annual air temperature in the project area varies from 9.9°C (the Obigarm Station) to 11.2°C (the Nurobod Station). The warmest months are July-August, with the average monthly temperature of 24.8°C in August. The absolute maximum temperature in August is 40°C in Obigarm, Rasht and 41°C at the Nurobod Station. The mean surface temperature is projected to increase by 3.01°C, 4.16°C and 5.93°C under SSP2-	▪ The project components are designed to withstand average daily surface temperature of 42°C. ▪ Expansion joints and bearings with 10% increased load capacity ▪ Design pavements for higher maximum temperatures ▪ Increased stiffness of bridge girders ▪ Sub-surface	**No** As the average daily surface temperature will be with in 42°C by year 2100. The absolute surface temperature is likely to exceed above 42°C but will be for very short duration of 2 days under SSP5-8.5 worst case scenario. This is not likely to cause any damage to the bridge infrastructure.	▪ No major risks are anticipated.	**No Prioritized Measures.** **Advisable Measure:** • Use of more expansion Joints in bridge pavement

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Climate Change Hazard	Current Embedded Measures in Preliminary Design	Additional Adaptation Measure requirement	Possible Risks (Without Additional Adaptation Measures)	Additional Adaptation Measures for Risk Mitigation
4.5, SSP3-7.0 and SSP5-8.5 scenarios respectively by 2100. The number of hot days with maximum temperature above 40 °C is projected to rise by 2 days under SSP 8.5 scenario.	drainage in abutments with drain ditches ▪ Slope stabilization measures, river bank protection works			

Table 12: Cost estimates for Key Adaptation Measures for the Project

Climate Variable	Prioritised Adaptation Measures	Advisable Adaptation Measure	Incremental cost of adaptation (USD)	Remarks
Temperature Rise	-	Use of more expansion Joints in bridge pavement	29,250	Estimated from Preliminary design
Increase in extreme rainfall events	Use of waterproof membrane for bridge deck	-	78246 - 294354	$1.05 to $3.95 per square foot x 74520 square foot
	Increased reinforcement in bridge piers	-	314000	Estimated from Preliminary design
	Providing more stiffness to the bridge girders	-	120000	Estimated from Preliminary design
	Increasing of Riprap installation at bridge piers	-	78800	Estimated from Preliminary design
	Regular inspection and maintenance of the pier	-	-	Part of Operations & Maintenance
	Increased drainage system capacity for bridge pavement	-	131000	Estimated from Preliminary design
	Slope stabilization measures, river bank protection works, bio-engineering works - vegetation along the slopes Sub-surface drainage in abutments	-	17,69,119	Estimated from Feasibility Study

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Total	**2,491,165-2,736,523**	

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IV. ASSESSMENT OF INCONSISTENCY WITH A NATIONAL/BROAD CONTEXT FOR CLIMATE RESILIENCE

45. Tajikistan has set up various national policies and strategies to address the impacts of climate change. We hereby assess the potential inconsistency of the project with key national climate adaptation and mitigation priorities of Tajikistan.

46. **(i) Intended Nationally Determined Contribution (NDC) 2021:** Tajikistan's revised NDC commits in 2021 to achieve a 40-50% reduction in emissions by 2030 compared to 1990 levels, conditional on international support. The country also set an unconditional emissions reduction target of 30-40% by 2030 compared to 1990 levels. The revised NDC expands adaptation in the energy, water, agriculture, forestry, and transportation sectors. Adaptation measures in the transport sector include improving the protection and long-term maintenance of transport infrastructure, updating national building codes for the construction of bridges, providing support to improve infrastructure and access roads in hazardous and vulnerable areas, adapting rail, road, air, and all modes of transport to international standards, and promoting incentives and regulations for fuel-efficient vehicles.[12] *The project is not inconsistent with Tajikistan's intended NDC as project design will consider measures for climate resilient infrastructure design of bridge and thus supports climate adaption in transport sector.*

47. **(ii) National Action Plan for Climate Change Mitigation:** Tajikistan's National Action Plan for Climate Change Mitigation outlines steps to reduce greenhouse gas emissions and increase resilience to climate change. The country aims to achieve a balance between economic development and environmental protection by promoting the use of renewable energy, increasing energy efficiency, and implementing carbon pricing mechanisms. Tajikistan also plans to conserve and restore ecosystems and enhance climate change adaptation measures, particularly in vulnerable communities.[13] *The project is aligned with Tajikistan's National Action Plan for Climate Change Mitigation as enhanced connectivity will lead to expanding public transportation networks, and promoting the use of clean energy vehicles, such as electric or hybrid cars and motorcycles.*

[12] Updated Nationally Determined Contributions (NDC) of the Republic of Tajikistan. 2021. https://policy.asiapacificenergy.org/sites/default/files/Updated%20Nationally%20Determined%20Contributions%20%28NDC%29%28EN%29.pdf

[13] Tajikistan National Action Plan on Climate Mitigation. Govt. of Tajikistan. 2003. https://unfccc.int/resource/docs/nap/tainap01e.pdf

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48. **(iii) National Strategy for Adaptation to Climate Change:** This presents a long-term outline of priority adaptation measures to prepare the country for projected climate change impacts until 2030. The National Strategy for Adaptation to Climate Change identifies key sectors sensitive to climate change. These sectors include energy, water resources, transport, agriculture, and various intersecting areas.[14] *The project is aligned with Tajikistan's National Strategy for* Adaptation *to Climate Change as it will enhance the resilience of transport infrastructure to withstand climate change impacts. The bridge design will consider future climate extremes. The bridge is designed to withstand future climate for the year 2100.*

49. **(iv) National Disaster Risk Reduction Strategy:** The National Disaster Risk Reduction Strategy of the Republic of Tajikistan is a comprehensive plan that aims to reduce the impact of disasters on the country's people and infrastructure. This strategy was formulated by the interdepartmental Working Group within the National Disaster Risk Reduction Platform. The DRR Strategy follows recommendations set forth in the Sendai Framework and takes into account the Agenda 2030, the National Development Strategy of Tajikistan until 2030, as well as the commitments under UNFCCC. It outlines risk mapping and hazard assessment, prevention and preparedness measures, and response and recovery plans. The key priorities of the DRR Strategy are as follows: (a) strengthen institutional capacities to integrate climate resilience in national development and investment planning; (b) improve the accuracy and timeliness of hydrometeorological services for early warning, weather forecasting and climate change; (c) make key water management and hydropower infrastructure more climate resilient; and (d) support land management measures to enhance rural livelihoods through greater resilience to climate-related shocks.[15] The strategy is implemented at the national and local levels, with support from international communities. The Tajik government regularly reviews and updates the strategy to ensure its effectiveness in addressing emerging risks and improving disaster resilience. The project is aligned with Tajikistan's National Disaster Risk Reduction Strategy as it will implement measures to ensure the continuity of transport services during emergencies.

50. The project is found to be aligned with Tajikistan's National Climate Change and Disaster Risk Reduction strategies. This includes consistency with Tajikistan's (a) Intended Nationally Determined Contribution (NDC) 2021, (b) National Action Plan for

[14] UNEP. https://leap.unep.org/en/countries/tj/national-legislation/national-strategy-adaptation-climate-change-republic-tajikistan

[15] Tajikistan: National disaster risk reduction strategy for 2019-2030. Govt. of Tajikistan. 2018.

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Climate Change Mitigation (c) National Strategy for Adaptation to Climate Change, and (d) National Disaster Risk Reduction Strategy.

V. CONCLUSION

51. The project has identified the climate related risks to the project components and suggested the adaptation measures to be included in the project design. The most serious threat comes from the expected increase in extreme precipitation events. This may not only lead to higher extreme discharges (i.e. flash floods) but can also lead to more frequent and more powerful mudflows, landslides, and avalanches. These may pose additional risks for bridge foundations and drainage systems (i.e. culverts) by discharge levels and solid loads exceeding the systems' design capacity. Similarly, an increase in extreme snowfall events may lead to an increase in the frequency of avalanches. Increases in precipitation extremes are also likely to increase the frequency of landslides and rockfall, upstream of the bridge location.

52. Considering the risks to the project components, we have identified the adaptation measures to mitigate the impact posed by climate change on project components. We further categorized these adaptation measures as Prioritized and Advisable. These measures include Prioritised Adaptation Measures: (i) Use of waterproof membrane for bridge deck, (ii) Increased reinforcement in bridge piers, (iii) Providing more stiffness to the bridge girders, (iv) Increasing of Riprap installation at bridge piers, (v) Regular inspection and maintenance of the pier, (vi) Increased drainage system capacity for bridge pavement, (vii) Slope stabilization measures, river bank protection works, bio-engineering works along the slopes, and (vii) Sub-surface drainage in abutments. Advisable Adaptation Measure: Use of more expansion Joints in bridge pavement.

53. We applied an incremental approach to estimate the climate finance of the identified climate adaptation measures. The cost of climate adaptation for the project is estimated to be in the range of USD 2.49 to 2.73 million.

54. We assessed the potential inconsistency of the project with relevant key national policies and strategies in Tajikistan and confirmed that the project was not inconsistent with Tajikistan's national policies and plans for adaptation.

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55. We therefore concluded that the project is aligned with climate adaptation and resilience goals (BB2 assessment) of the Paris Agreement Alignment of AIIB criteria once the climate adaptation measures are included in the project design.

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VI. APPENDICES

Appendix 1: CLIMATE CHANGE TRENDS

A. Observed Climatic Conditions of Project Area

1. Between 1940 and 2020, Tajikistan experienced a temperature increase of 0.1ºC-0.2ºC for each decade of that period. The number of days with temperatures of 40ºC and above is increasing. The mountainous areas experienced an increase of 0.3ºC-0.5ºC, while the alpine zones experienced an increase of 0.2ºC-0.4ºC. Temperatures were 0.1ºC-1.1ºC higher on average in winter and 0.1ºC- 1.3ºC higher in spring. Autumn temperatures in all mountainous areas exceeded the average by 0.6ºC-1.1ºC. Tajikistan has the highest percentage of mountainous areas in the region, occupying 93% of the country. More than half of Tajikistan's mountains are at elevations of 3,000 meters or higher. Data from 1940 to 2020 show that temperatures have increased in most areas of the country, including low-altitude (up to 1,000 m.a.s.l.) mountainous (1,000-2,500 m.a.s.l.) and high-altitude (above 2,500 m.a.s.l.) areas, but the extent of warming varies with geographic location and climatic factors. In the flat territory of Tajikistan, the average annual temperature increased by 0.1-0.2°C over the decade, with the largest increase of 0.5°C -0.8°C[16].

2. Annual precipitation varies by regions of the Republic of Tajikistan. Most of the plains and foothills, as well as areas of western Tajikistan are characterized by a course of annual precipitation with a minimum in the summer months. Maximum precipitation is in March-April in valleys and foothills and in April-May in highlands. This is explained by the fact that in spring the planetary altitude frontal zone is located over the territory of Central Asian plains, and later it shifts to the north-east.

3. The average annual air temperature in the project area varies from 9.9°C (the Obigarm Station) to 11. 2°C (the Nurobod Station). The coldest month is January with the average monthly temperature at the Obigarm, Rasht Stations - 4.6°C, and at the Nurobod Station - 4.1°C. The warmest months are July-August, with the average monthly temperature of 24.8°C in August (the Nurobod Station). Absolute minimum temperatures are in January and range from -30°C at the Nurobod Station to -32°C at the Rasht Station. The absolute maximum temperature in August is 40°C in Obigarm, Rasht and 41°C at the Nurobod Station.

4. The frost-free period averages 226 days, with the average first cold spell occurring in the first decade of November and the last - in late March and early April. The soil surface temperature, like air temperature, is determined by the radiation and circulation regime. The surface temperature of the soil also depends on the mechanical composition and type of soil, its moisture content, surface condition, etc. The average monthly temperature of the soil surface in the winter months does not differ much from the air temperature, while in the summer months the difference reaches 5-7°C.

5. According to meteorological stations, the frost-free period on the soil surface lasts up to 183 days a year. The average date of the first cold spell is in the first decade of October and the last - in the second half of April. Noteworthy is the uneven distribution of precipitation both on a multi-year and annual basis.

[16] Fourth National Communication of The Republic Of Tajikistan Under The United Nations Framework Convention on Climate Change. Govt. of Tajikistan. 2022.

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6. The precipitation maximum amount is observed in the winter-spring period and its almost complete absence - in August-September. The total annual precipitation is up to 936 mm (in the Nurobod Meteorological Station). The maximum daily rainfall at the Rasht Meteorological Station was recorded at 81 mm.

7. The number of days with snow cover reaches up to 85 days. The earliest date of snow cover occurrence is on 27 October and the latest - on 1 January. The earliest date of snow cover melt is on 26 February and the latest - on 16 April.

8. The average ten-day snow cover thickness is ranging from 2 cm in December to 52 cm in February. The maximum height of snow cover recorded at the Obigarm Meteorological Station is 114 cm.

9. Air humidity can be judged by the value of water vapour elasticity, relative humidity, as well as by the lack of air saturation and water vapour. The elasticity of water vapour in the air varies annually as does the air temperature. It reaches its lowest value in winter - in January (3.4 mb). The maximum absolute air humidity is reached in the period of intensive evaporation (May-July) and amounts to 12 mb. Mean annual relative humidity is 59 % on average. During the year, the lowest relative humidity values at 35-38 % are observed in August and September and the highest at 67-77 % in December and March. From the above it can be concluded that the highest humidity is observed in winter and the lowest - in the summer-autumn period. Accordingly, the highest humidity deficit occurs in the warm period of the year and the lowest - in the cold period. The average annual saturation deficit ranges from 7.7 mb (the Obigarm Station) to 8.9 mb (the Nurobod Station).

10. The terrain orography has a great influence on the processes of ice formation. The intensity and recurrence, as well as the duration of ice and drizzle formation depend on a complex set of factors such as terrain elevation, topography, slope exposition, etc. Ice and drizzle events in the bridge crossing design area are rare, and observations are of a visual nature. Ice occurs less frequently in the area under consideration than drizzle. The following table shows the average number of days with ice and drizzle per month and per year. The maximum number of days with drizzle occurs in January and with ice - in March.

11. Analyzing the above data, it is noted that the project area is characterised by a continental climate: dry and hot summers, uneven distribution of precipitation over the seasons of the year and a large amplitude of air temperature fluctuations, both annual average and daily.

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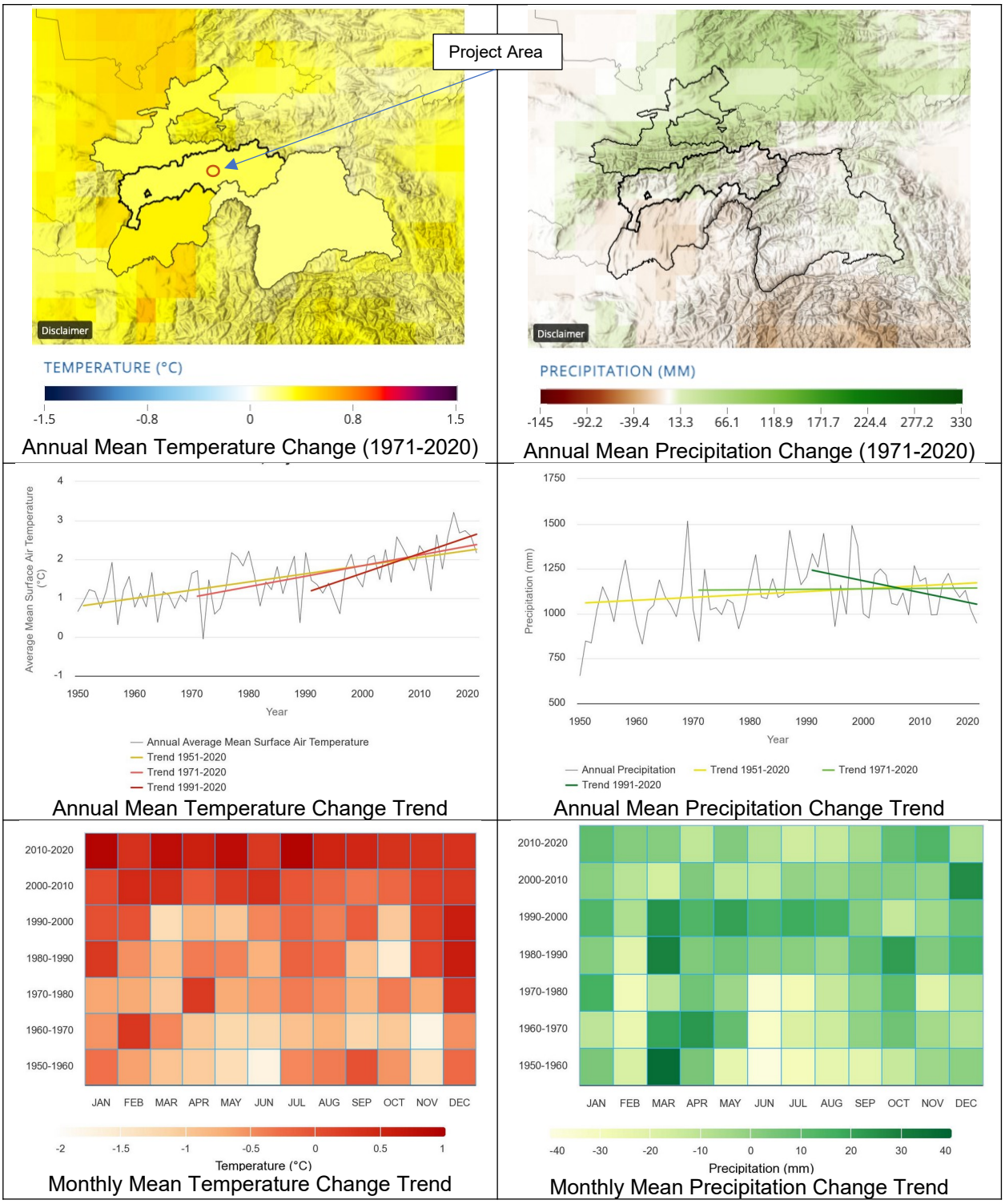

Figure 1: Observed Climate Change Trend in the Project Area in Tajikistan (Source: World Bank Climate Knowledge Portal.)

12. **Extreme Natural Disasters**. Tajikistan is prone to natural disasters such as floods, avalanches, landslides, extreme temperatures and droughts, which are exacerbated by climate

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change. During the period 1997-2018, about 4,194 natural disasters occurred in Tajikistan. In particular, on average, one natural disaster occurred every two days. Mudflows are the most common (on average 70 situations per year) and the most dangerous (on average 35 deaths per year) type of disasters in Tajikistan. Avalanches rank second in these indicators (an average of 27 situations and 6 deaths per year). Total losses from natural disasters for the period 1997-2018 amounted to 589 million US dollars, or an average of more than 25 million US dollars per year. The largest financial losses - on average about $15 million per year - are associated with mudflows. The second most important source of financial losses is droughts ($5.4 million). Earthquakes should be noted in the third place in terms of financial damage (3.3 million US dollars)[8].

13. The region of Tajikistan where the Rogun Hydropower Project is currently under construction has experienced large and catastrophic slope failures in the past, often triggered by earthquakes. Co-seismic slope failures are thus common and pose a high hazard potential.

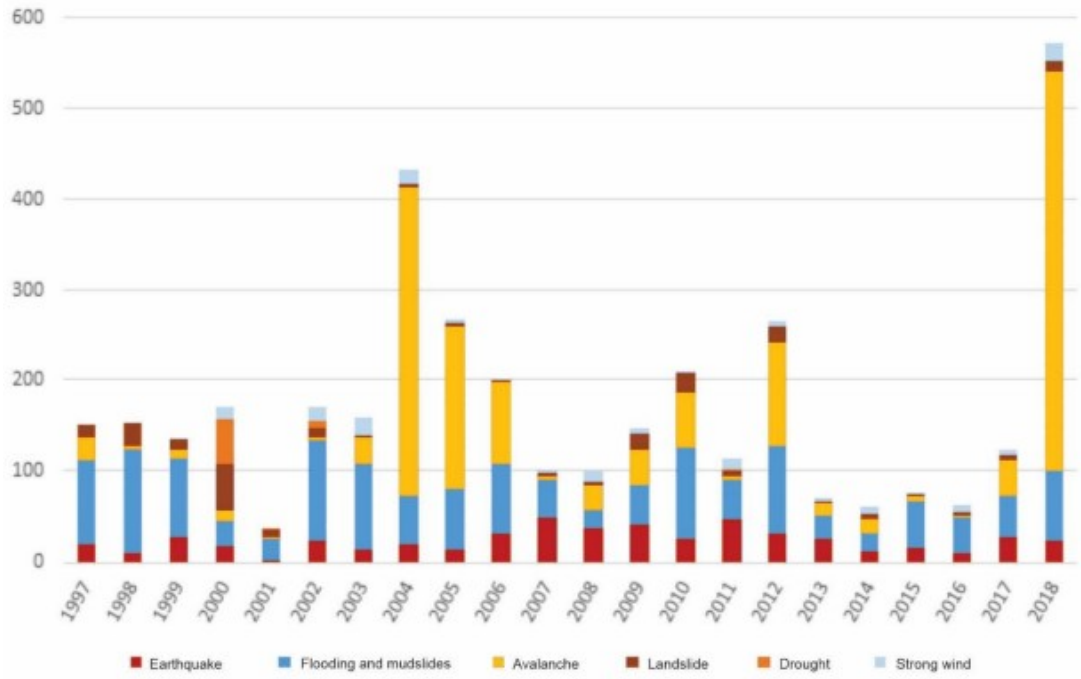

Figure 2: Extreme Natural Disasters in Tajikistan for 1997-2018 (Source: Committee on Emergency Situations and Civil Defense of the Republic of Tajikistan)

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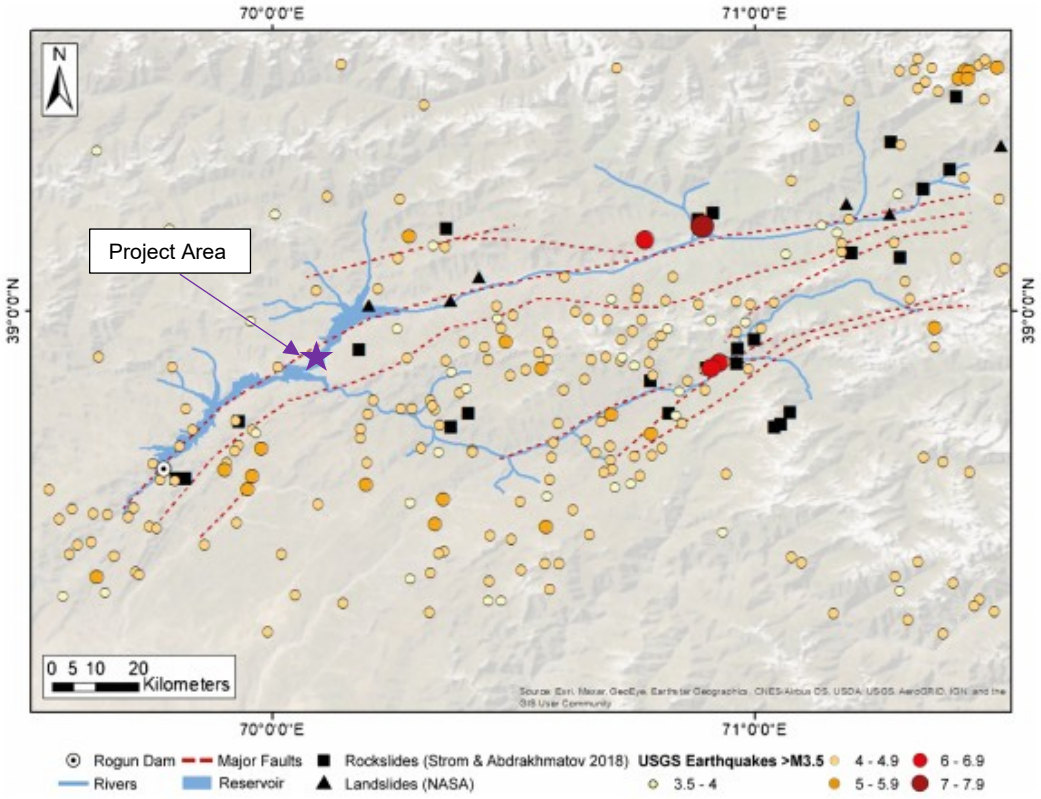

Figure 3: Locations of known landslide and earthquakes (M≥3.5) occurred from 2000 to 2019 (Source: Jones, N., Manconi, A., & Strom, A. (2021). Active landslides in the Rogun Catchment, Tajikistan, and their river damming hazard potential. Landslides, 18 (11), 3599-3613.)

2 Climate Change Projections for Tajikistan

14. Shared Socioeconomic Pathways (SSPs) are a collection of scenarios, first making an appearance in an IPCC's sixth Assessment Report on climate change in the AR6 published on 9 August 2021. Here, scientists looked at "possible climate futures", exploring five core emissions scenarios, spanning from the "very low emissions" SSP1-1.9, "low" SSP1-2.6 and "intermediate" SSP2-4.5, through to "high" SSP3-7.0 and "very high" SSP5-8.5.

15. In the IPCC's Sixth Assessment Report (AR6) five climate narratives were provided with different levels of projected warming and our ability to adapt to the coming changes. Each one of these stories brought together a different socioeconomic development scenario with a different carbon emissions pathway, to create a scenario matrix that shows how our choices will shape climate change in the 21st century. Each SSP includes projections of population and economic growth, as well as technological and geopolitical trends—all of which will have an impact on both our emissions and our ability to reduce or adapt to them.

16. The five "families" of SSP-based scenarios used in CMIP6 can be categorized along two broad axes: challenges to mitigation and challenges to adaptation. SSP1 (Sustainability) has low challenges to both mitigation and adaptation. In this scenario, policies focus on human well-being, clean energy technologies, and the preservation of the natural environment. In contrast,

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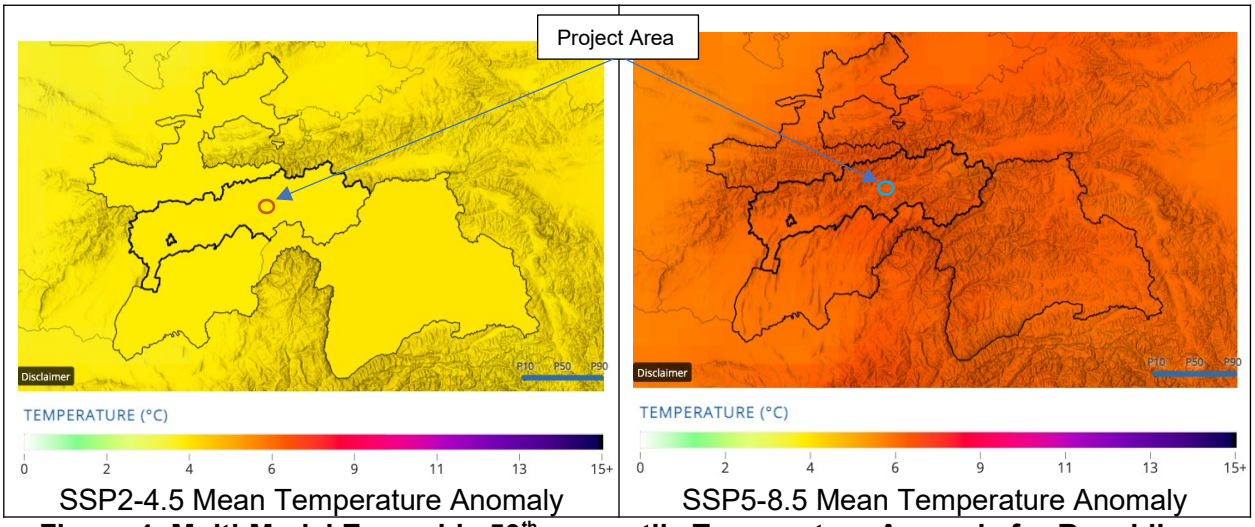
SSP3 (Regional Rivalry) is characterized by high challenges to both mitigation and adaptation. In this scenario, nationalism drives policy and focus is placed on regional and local issues rather than global issues. The other SSPs "fill in the spectrum" of possible futures. SSP4 (Inequality) is defined by high challenges to adaptation and low challenges to mitigation, SSP5 (Fossil-fueled Development) is characterized by high challenges to mitigation and low challenges to adaptation, and SSP2 (Middle of the Road) represents moderate challenges to both mitigation and adaptation.

17. **Temperature.** Annual average multi-model ensemble (50th percentile) anomaly under the SSP2–4.5 scenario shows that the average temperature is expected to rise by 3.1°C for the period 2090s (2080–2099) relative to the average temperature for baseline period (1995–2014) levels of 4.96°C. Under SSP3–7.0 scenario, the average temperature is expected to rise by 4.16°C for 2090s relative to baseline levels. Under the SSP5-8.5 scenario, the average temperature is expected to rise by 5.93°C for the period 2090s relative to baseline levels.[17]

18. Under the SSP2–4.5 scenario average minimum temperature is expected to rise by 2.83°C for the period 2090s relative to the minimum average temperature for baseline period levels of (-0.72)°C. Under the. SSP3–7.0 scenario, the minimum temperature is expected to rise by 4.03°C for the period 2090s, relative to baseline levels. Under the SSP5–8.5 scenario, the minimum temperature is expected to rise by 5.61°C for the period 2090s, relative to baseline levels.

19. Under the SSP2–4.5 scenario the average maximum temperature is expected to rise by 3.13°C for the period 2090s relative to the average maximum temperature for baseline period levels of 10.66°C. Under the SSP3–7.0 scenario, the maximum temperature is expected to rise by 4.4°C for the period 2090s, relative baseline levels. Under the SSP5–8.5 scenario, the maximum temperature is expected to rise by 6.22°C for the period 2090s, relative to baseline levels.



SSP2-4.5 Mean Temperature Anomaly SSP5-8.5 Mean Temperature Anomaly

Figure 4: Multi-Model Ensemble 50th percentile Temperature Anomaly for Republican Subordination, Tajikistan; (Ref. Period: 1995-2014) for 2080-2099 (Source: World Bank Climate Knowledge Portal.)

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20. **Precipitation.** Under the SSP2–4.5 scenario, the change in annual average rainfall is expected to rise by 34.4mm for the period 2090s, relative to the baseline annual average rainfall of 1163.15mm. Under the SSP3-7.0 scenario, the change in annual average rainfall is expected to rise by 94.59mm for the period 2090s, relative to the baseline annual average rainfall. Under the SSP5-8.5 scenario, the change in annual average rainfall is expected to rise by 39.86mm for 2090s, relative to baseline levels.

Table 1: Multi-model ensemble anomaly in 2090s for Tajikistan[17]

Parameters	Observed (1995-2014)	Average Annual Anomaly (2080-2099) Multi-Model Ensemble		
		SSP2-4.5	SSP3-7.0	SSP5-8.5
Rainfall, mm	1163.15	34.4 (-65.6 - 128.9)	94.59 (-56.65 - 252.71)	39.86 (-88.45 - 221.66)
Mean Surface Temperature, °C	4.96	3.01(2.26-4.16)	4.16(3.35-5.95)	5.93(4.45-8.04)
Minimum Surface Temperature, °C	-0.72	2.83(2.29-4.01)	4.03(3.35-5.69)	5.61(4.41-7.99)
Maximum Surface Temperature, °C	10.66	3.13(2.27-4.32)	4.4(3.32-6.28)	6.22(4.41-7.97)

Source: World Bank Climate Knowledge Portal.

21. **Extreme climatic events.** Change in average largest 1-Day precipitation: Under SSP2-4.5 scenario, change in average largest 1-Day precipitation relative to the baseline period value of 37.32 mm (1995–2014) is projected to be 11.99 mm for 2090s whereas under SSP5-8.5 scenario, change relative to the baseline period value is projected to be 17.12 mm for 2090s.

22. Change in 5-Day cumulative rainfall: Under SSP2-4.5 scenario, change in 5-Day cumulative rainfall relative to the baseline period value of 101.13 mm is projected to be 17.13 mm for 2090s whereas under SSP5-8.5 scenario, change relative to the baseline period value is projected to be 32.59 mm for 2090s.

23. Percentage change in precipitation: Under SSP2-4.5 scenario, percentage change in precipitation relative to the baseline is projected to be 3.37% for 2090s whereas under SSP5-8.5 scenario, change relative to the baseline is projected to be 3.42% for 2090s.

24. Number of Frost days (Tmin < 0°C): Under SSP2-4.5 scenario, number of frost days relative to the baseline period value of 220 is projected to be reduced by 36 days for 2090s whereas under SSP5-8.5 scenario, number of frost days relative to the baseline period value is projected to be reduced by 66 days for 2090s.

[17] World Bank Climate Knowledge Portal.

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25. Number of hot days (Tmax > 30°C): Under SSP2-4.5 scenario, number of hot days relative to the baseline period value of 8 is projected to be increased by 9 days for 2090s whereas under SSP5-8.5 scenario, number of hot days relative to the baseline period value is projected to be reduced by 21 days for 2090s.

26. Number of ice days (Tmax < 0°C): Under SSP2-4.5 scenario, number of ice days relative to the baseline period value of 116 is projected to be reduced by 28 days for 2090s whereas under SSP5-8.5 scenario, number of hot days relative to the baseline period value is projected to be reduced by 51 days for 2090s.

Table 2: Average Annual Multi-Model Mean Ensemble Anomaly in Extreme Weather Event Indices in Tajikistan for 2090s

Climate Variable	Baseline Period Value (1995 - 2014)	Average Annual Anomaly (2080-2099) Multi-Model Ensemble		
		SSP2-4.5	SSP3-7.0	SSP5-8.5
Average Largest 1-Day Precipitation	37.32	11.99 (2.25-22.39)	16.54 (5.34-25.79)	17.12 (6.81-26.1)
Average Largest 5-Day Cumulative Precipitation	101.37	17.13 (-7.76-47.33)	33.1 (4.43-67.87)	32.59 (5.21-64.03)
Percentage Precipitation Change (%)	-	3.37 (-9.74-10.52)	6.59 (-5.48-15.7)	3.42 (-11.18-15.7)
Number of Frost Days (Tmin < 0°C)	220.17	-35.64(-55.72--23.37)	-52.17(-78.93--37.34)	-65.88(-99.07--50.97)
Number of Hot Days (Tmax > 30°C)	8.17	8.52(5.83-12.98)	12.6(8.89-18.73)	21.03(12.87-33.99)
Number of Ice Days (Tmax < 0°C)	115.98	-28.05(-40.34--19.16)	-39.32(-61.13--29.54)	-50.7(-70.6--37.06)

Source: World Bank. *Climate Change Knowledge Portal.*

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Appendix 2: Hydrological Assessment of Surkhob River

1. The Surkhob River is formed by the confluence of two rivers: Kyzylsu and Muxu. The total catchment area of these rivers is 15,390 km^2 or 39.4 % of the catchment area of Vakhsh River (39,100 km^2). After the confluence of the Kyzylsu and Muksu rivers, the river receives the name Surkhob, and after the confluence of Surkhob and Obihingou Rivers Vakhsh River is formed. The full length of Vakhsh River before its confluence with Panj River is 786 km. There are hundreds of glaciers in the catchment area of Vakhsh River with a total area of about 5,000 km^2. In the middle reaches of Vakhsh River, where the reservoir and bridge crossing will be located, the highest ridge elevations do not exceed 3,500-4,000 m.

2. Surkhob (Vakhsh) River is a glacier-snow-fed river (according to V. L. Shchultz classification) with a corresponding intra-annual flow distribution. The river flow regime is determined by both climatic and physical-geographical conditions of the basin with the considerable height of the catchment area due to which eternal snows and glaciers are widespread here, with high atmospheric precipitation, as well as high specific and absolute water content.

3. The annual course of water discharge of Surkhob River is characterized by alternation of rise and fall of water discharge in the warm part of the year (high waters) and their low stable position in the cold period (low waters). The southern position of the catchment area and thick snow cover even in lower belts of mountains causes, taking into account the height of catchment area, early beginning of floods falling on average in Garm township in early April.

4. Liquid precipitation also plays a relatively large role in feeding the river, creating a series of rainfall peaks in the spring that overlap the main flooding period. The flooding period lasts for up to 180 days and ends, on average, at the end of the first decade of October. The beginning and the end of the period of high-water flows fluctuate significantly, mainly as a result of changes in intensity of snow and glacier melting in the mountains.

5. The highest mean monthly discharges are in July and August, and the discharges in September are well below those in August and slightly below those in June (Figure 1). After the high-water period, there is a long and steady low water period in autumn and winter, with low water discharge on average in February. The average discharge of the Surkhob in Garm is 333 m^3/sec, with a discharge module of 16.6 l/sec, km^2. The annual flow of Surkhob River is stable and varies from 263 m^3/sec to 456 gt3/sec.

6. Surkhob River is mainly fed by meltwater, and thus the maximum flow rate in the river is associated with the flood phase. Since rainwater plays an insignificant role in the total flow of Surkhob River, the maximum flow of water in the river is entirely formed by meltwater. The average date of the flood peak is 24 July, with the earliest date on 24 June and the latest date on 16 August.

7. The highest maximum discharge in Surkhob River in Garm for the period of observations (1933-1970) was 2,690 m^3/sec (15 July 1958). The next highest discharge was recorded in July 1952 and was equal to 2,170 m^3/sec. The average value of maximum streamflow in Garm was 1,490 m^3/sec, and the lowest maximum streamflow (915 m^3/sec) was observed on 3 August 1951. The lowest low-water flow was recorded at 94.7 m^3/sec on average, with the highest of 113 m^3/sec in 1955 and the lowest of 40.3 m^3/sec.

8. Work by Paltan et al. (2018) demonstrates that even under lower emissions pathways coherent with the Paris Climate Agreement, nearly all Asian countries face an increase in the frequency of extreme river flows. What would historically have been a 1 in 100-year flow, could become approximately a 1 in 50-year or 1 in 25-year event. There is good agreement among models on this trend. There are multiple factors leading to these changes, including climate change-driven melting of glaciers and increased extreme precipitation intensities in the upstream basins. However, projected changes could also be subject to future development trajectories. Increases in extreme river flows are likely to place pressure on flood defense system that without adaptation action are expected to

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increase the risk of disaster-level fluvial flood events. The study detects that in Central Asia region, the median increase of the frequency of the current 1-in-100 year flow is once in 70–90 years at 1.5 °C, and at 2.0 °C this frequency increases to at least once in 50 years. This change is accompanied by shorter, and consequently more intense, rainy seasons. As such, committing to a 1.5 °C level of warming reduces the chance of high flows in these regions[18]. The projected increase in intensity of extreme precipitation events implies that this risk increases in the future.

9. As shown in the flood hazard map of 25 Years to 1000 Years return period events in Figure 2 generated by UNEP Global Risk Platform, the flood of 180 cm - 720 cm is expected in the project area.

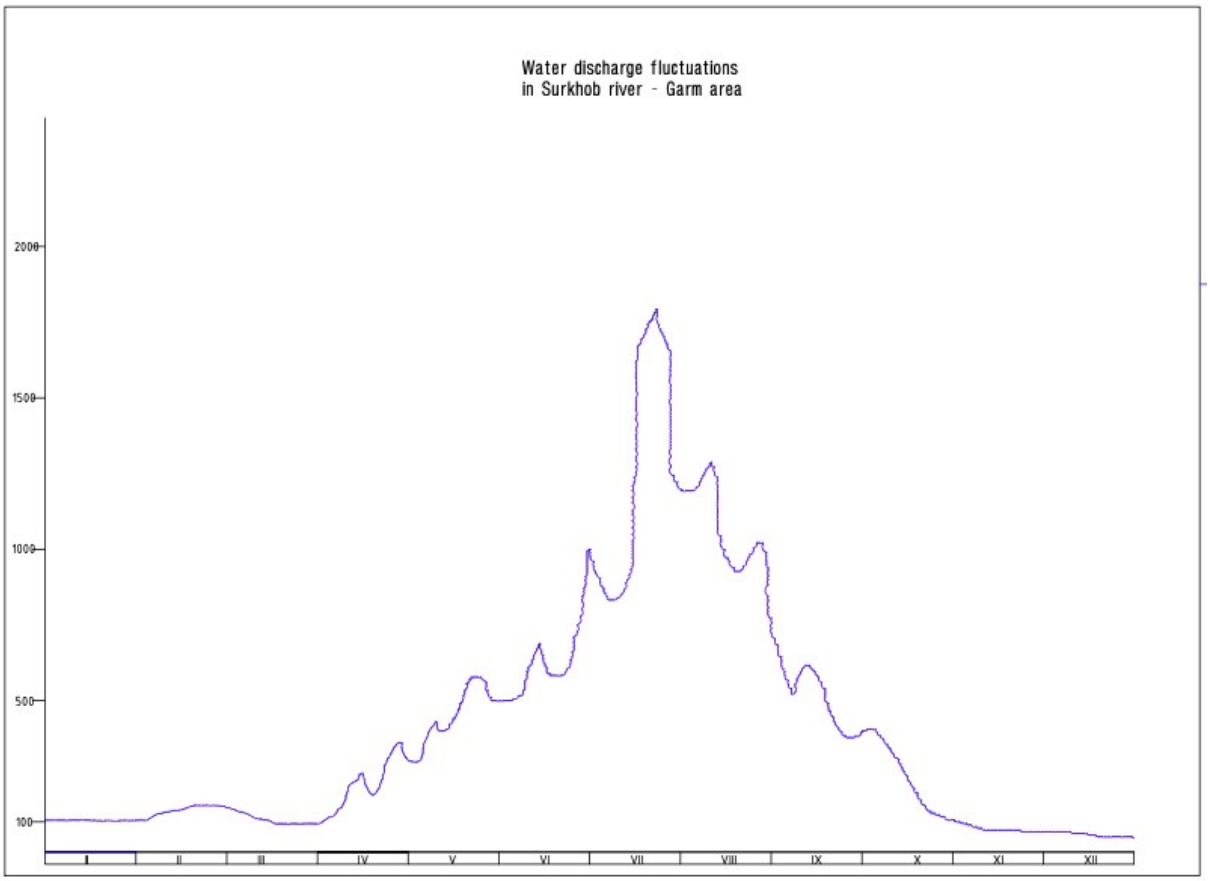

Figure 1: Water Discharge Fluctuations in Surkhob river - Garm Area

[18] Homero Paltan et al 2018 Environ. Res. Lett. 13 094003

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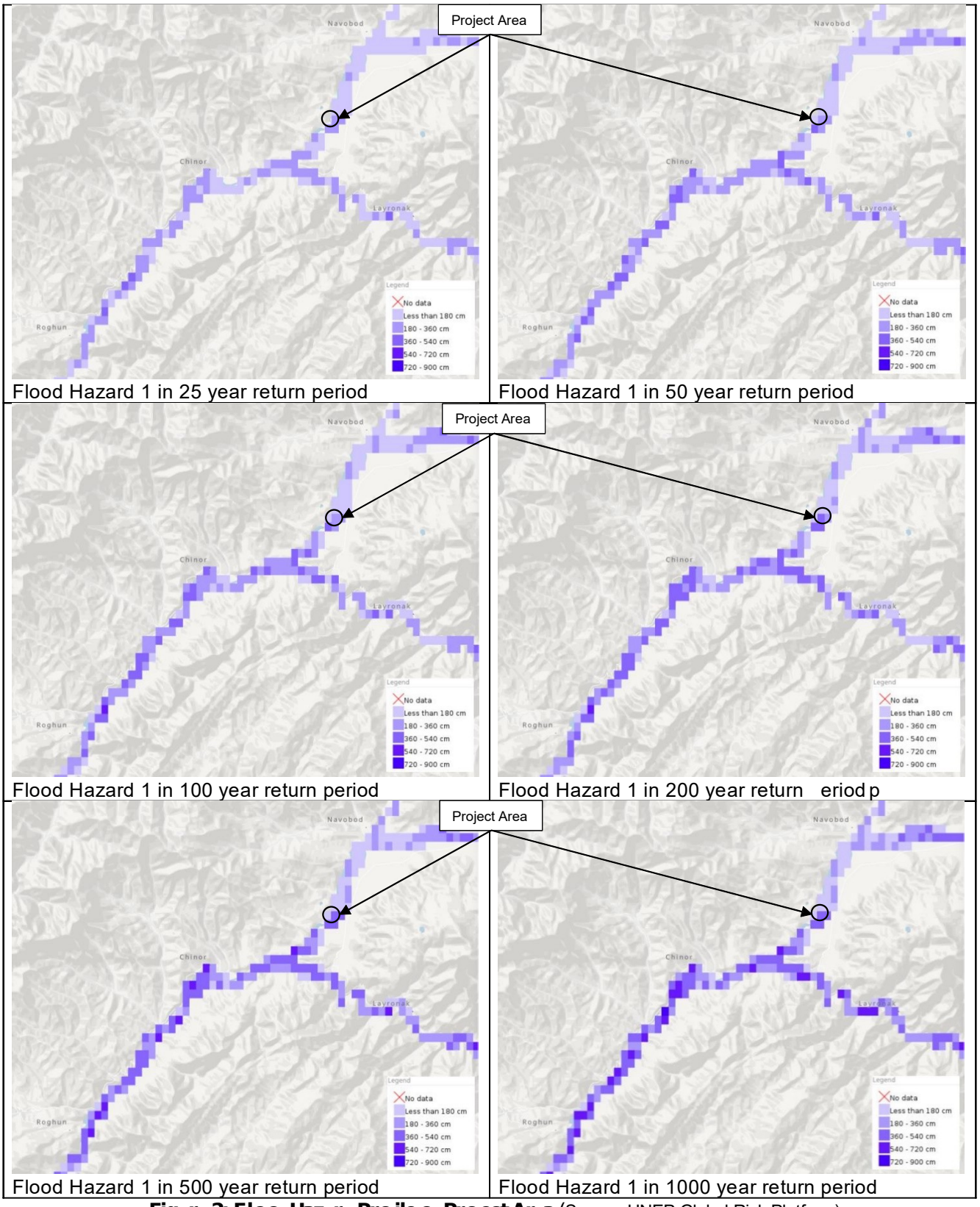

Fig r 2: Floo Haz r Proile o Proect Ar a (Source: UNEP Global Risk Platform)
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Appendix 3: Initial Climate Risk Screening using AWARE FOR PROJECTS Tool

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Section 1 of 19

Project created and Report generated by Sani Zou, Asian Infrastructure Investment Bank (AIIB) | Date created: 17.05.2023 05:06

01

Introduction

This report summarises results from a climate and geological risk screening exercise. The project information and location(s) are detailed immediately below.

The screening is based on the Aware™ geographic data set, compiled from the latest scientific information on current geological, climate and related hazards together with projected changes for the future where available. These data are combined with the project's sensitivities to hazard variables, returning information on the current and potential future risks that could influence its design and planning.

Project Information

PROJECT NAME:	Tajikistan Bridge Obigarm-Nurobod Project
SUB PROJECT:	Tajikistan Bridge project
PROJECT NUMBER / REFERENCE:	n/a
SECTOR:	SECTION F: CONSTRUCTION
SUB SECTOR:	Civil engineering - construction of bridges & tunnels
DESCRIPTION:	the project includes replacement of 76 km of road M-41 in the mountain range north of the Vakhsh River Valley (ObigarmNurobod). Construction of the new Obigarm-Nurobod road is divided into 3 sections: section 1 and section 2 will include 3 tunnels and 14 new and reconstructed mediumsized bridges, aconstruction of a Long Bridge and the associated approaches- AIIB Investment will finance the construction of the bridge only.

02

Chosen Locations

1) Location 1

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Section 3 of 19

03 Project Climate Risk Ratings

Below you will find the overall climate risk level for the project together with a radar chart presenting the level of risk associated with each individual climate risk topic analysed in Aware™. Projects with a final "High risk" rating are always recommended for further more detailed climate risk analyses.

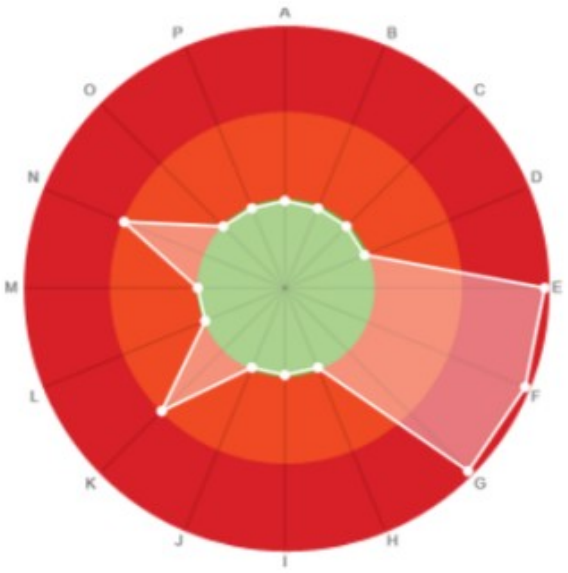
The radar chart provides an overview of which individual risks are most significant. This should be used in conjunction with the final rating to determine whether the project as a whole, or its individual components, should be assessed in further detail. The red band (outer circle) suggests a higher level of risk in relation to a risk topic. The green band (inner circle) suggests a lower level of risk in relation to a risk topic.

In the remaining sections of this report more detailed commentary is provided. Information is given on existing and possible future climate conditions and associated hazards. A number of questions are provided to help stimulate a conversation with project designers in order to determine how they would manage current and future climate change risks at the design stage. Links are provided to recent case studies, relevant data portals and other technical resources for further research.

Final project climate risk ratings

High Risk

Breakdown of climate risk topic ratings



A) Temperature increase
B) Wild fire
C) Permafrost
D) Sea ice
E) Precipitation increase
F) Flood
G) Snow loading
H) Landslide
I) Precipitation decrease
J) Water availability
K) Wind speed increase
L) Onshore Category 1 storms
M) Offshore Category 1 storms
N) Wind speed decrease
O) Sea level rise
P) Solar radiation change

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PRECIPITATION INCREASE

Would an increase in precipitation require modifications to the design of the project in order to successfully provide the expected services over its lifetime?

Chosen Answer

Yes - a lot.

Major modifications may be required to the design of the project if precipitation increases.

ACCLIMATISE COMMENTARY

1. What does this mean for the design of my project?

• There is a potential for an increase in incidences where current design standards will not be sufficient. See "Critical thresholds" in the "Help and glossary" section for further details on how a changing climate can impact on critical thresholds and design standards.

• The design, operational and maintenance standards should be reviewed - take into consideration current impacts of heavy precipitation events as well as potential future changes.

2. How could current heavy precipitation affect the project even without future climate change?

• Seasonal runoff may lead to erosion and siltation of water courses, lakes and reservoirs.
• Flooding and precipitation induced landslide events.
• In colder regions, seasonal snow falls could lead to overloading structures and avalanche risk.
• If our data suggests that there are existing hazards associated with heavy precipitation in the region, they will be highlighted elsewhere in the report. This may include existing flood and landslide risks.

3. What does the science say could happen by the 2050s?

• Climate model projections do not agree that annual average precipitation will increase in the project location which could indicate a relatively high degree of uncertainty (see the section "Model agreement and uncertainty" in "Help and glossary" at the end of this report). On the other hand, this could also mean precipitation patterns are not expected to change or may even decrease (see elsewhere in the report for more details of projections related to precipitation decrease).
• If you want to know more about projected changes in the project location across a range of GCMs and RCPs please refer to USGS's CMIP5 Global Climate Change Viewer for detailed maps.

4. What next?

1. See the section "Further reading" in "Help and glossary" at the end of this report which lists a selection of resources that provide further information on a changing climate.
2. Click here for the latest news and information relating to water and climate change.

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Section 5 of 19

05
HIGH RISK

FLOOD

ACCLIMATISE COMMENTARY

• Our data suggest that the project is located in a region which has experienced recurring major flood events in the recent past. A high exposure in Aware means that between 1985 and 2016 there has been at least one significant, large-scale flood event in the region. This is based on post-processed data from the Dartmouth Flood Observatory at the University of Colorado.

• The risk and type of flooding is dependent on local geographical factors including:
- Proximity to the coast and inland water courses
- Local topography
- Land use characteristics, including land use in upstream catchment area
- Design and maintenance level of drainage infrastructure
- Vulnerability of exposed assets
• Up to date information on flood risk worldwide is available online, for example UNEP / UNISDR's Global Risk Data Platform and Dartmouth Flood Observatory's Global Active Archive of Large Flood Events.

1. What does this mean for the design and construction of my project?

• If floods are identified as a potential problem for the project, it is recommended that:
- More localized information is collected on past floods and their consequences in the exact project location, especially since flood hazard can change significantly over short distances; depending on the findings, a site-specific flood risk assessment (including flood modelling) might be required that provides a good understanding of the current and future flood risk level
- Information is collected on land use and building regulations, such as flood zonation ordinances
- The project siting, design and construction features ensure that site-specific flood risk management measures are undertaken. Such measures could include a combination of grey infrastructure (such as flood defence infrastructure) and green infrastructure (such as restoration of wetlands) to reduce flood risk, as well as measures to manage the residual flood risk (such as through flood early warning, flood preparedness planning, flood insurance etc.)

2. What does the science say could happen in the future and what does this mean for the design of my project?

• Climate change is projected to influence the frequency and intensity of flood events.
• Existing engineering designs may not take into consideration the impact of climate change on the risks from flooding. See "Critical thresholds" in the "Help & glossary" section for further details on how a changing climate can impact on critical thresholds and design standards.

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06
HIGH RISK

SNOW LOADING

ACCLIMATISE COMMENTARY

Our data suggest that the project is located in a region where snow is commonly observed and future precipitation may also increase (2050s). This is based on snow extent data for the northern (1967 — 2005) and southern hemispheres (1987 — 2002) from the US National Snow and Ice Data Centre (NSIDC) in addition to precipitation projections from 16 GCMs. Up to date information on snow conditions worldwide is available online from the NSIDC.

1. What the science says could happen in the future and what does this mean for the design of my project?

• The impact of increasing precipitation at higher latitudes could represent an increased risk of snow loading which could impact on the structural integrity of buildings and other infrastructure.
• Existing design standards may not take into consideration the impact of climate change on snow loading risk. See "Critical thresholds" in the "Help & glossary" section for further details on how a changing climate can impact on critical thresholds and design standards.
• If increased snow loading could be a problem for the project, it is recommended that a more localised and in-depth assessment is carried out. This information can then be used to inform the project design process if necessary.

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07
MEDIUM RISK

WIND SPEED INCREASE

Would an increase in average and maximum wind speed require modifications to the design of the project in order to successfully provide the expected services over its lifetime?

Chosen Answer

Yes - a little.

The design of the project may have to be slightly modified to cope with the impact of increased wind speed.

ACCLIMATISE COMMENTARY

1. What does this mean for the design of my project?

• The project is considered to have high sensitivity to wind and there is a potential for an increase in incidences where current design standards will not be sufficient. See "Critical thresholds" in the "Help and glossary" section for further details on how a changing climate can impact on critical thresholds and design standards.

• The design, operational and maintenance standards should be reviewed - take into consideration current impacts of increasing wind speed as well as potential future changes.

2. How could stronger winds affect the project even without future climate change?

• The design and operation of certain infrastructure (e.g. wind turbines) is determined by the prevailing climatic wind conditions.
• Given the energy in the wind is the cube of wind speed, a small change in the wind climate can have substantial consequences for the wind energy available.
• Similarly, small changes could have dramatic consequences for wind related hazards e.g. wind storm damage.
• If our data suggests that there is an existing risk of tropical storms in the region, it will be highlighted elsewhere in the report.

3. What does the science say could happen in the future?

• Climate change could alter the geographic distribution and/or the seasonal variability of wind resource.
• Climate model projections remain uncertain and it appears unlikely that mean wind speeds will change by more than the current inter-annual variability.
• Changes in extreme wind speeds associated with extra-tropical and tropical storm are similarly uncertain. However, there have been studies that suggest fewer but more intense events. Stronger storms bring with them an increases risk of coastal storm surge, coastal erosion, wind damage and flooding.
• Given future uncertainty it is advisable to carefully assess past wind speed in the region, bearing in mind that it could change in the future. The UNEP Solar and

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08
MEDIUM RISK

WIND SPEED DECREASE

Would a decrease in average and maximum wind speed require modifications to the design of the project in order to successfully provide the expected services over its lifetime?

Chosen Answer

Yes - a little.

The design of the project may have to be slightly modified to cope with the impact of decreased wind speed.

ACCLIMATISE COMMENTARY

1. What does this mean for the design of my project?

• A change in wind related risks may lead to incidences where current design standards will not be met and also for 'over designing' for risks that might diminish. See "Critical thresholds" in the "Help and glossary" section for further details on how a changing climate can impact on critical thresholds and design standards.

• The design, operational and maintenance standards should be reviewed - take into consideration current impacts of reduced wind speed as well as potential future changes.

2. How could reductions in wind speed affect the project even without future climate change?

• The design and operation of certain infrastructure (e.g. wind turbines) is determined by the prevailing climatic wind conditions.
• Given the energy in the wind is the cube of wind speed, a small change in the wind climate can have substantial consequences for the wind energy available.

3. What does the science say could happen in the future?

• Climate change could alter the geographic distribution and/or the seasonal variability of wind resource.
• Climate model projections remain uncertain and it appears unlikely that mean wind speeds will change by more than the current inter-annual variability.
• Given future uncertainty it is advisable to carefully assess past wind speed in the region, bearing in mind that it could change in the future. The UNEP Solar and Wind Energy Resource Assessment SWERA provides a useful global overview of wind information.

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09
LOW RISK

TEMPERATURE INCREASE

Would an increase in temperature require modifications to the design of the project in order to successfully provide the expected services over its lifetime?

Chosen Answer

No - modifications are not required.

The design of the project would be unaffected by increases in temperature.

ACCLIMATISE COMMENTARY

1. What does this mean for the design of my project?

• Even though you have suggested that project designs would not be sensitive to rising temperatures, it is worth considering existing temperature related hazards in the region where the project is planned.
• There is a potential for an increase in incidences where current design standards will not be sufficient. See "Critical thresholds" in the "Help and glossary" section for further details on how a changing climate can impact on critical thresholds and design standards.

• The design, operational and maintenance standards should be reviewed - take into consideration current impacts of high temperatures as well as potential future changes.

2. How could current high temperatures affect the project even without future climate change?

• Heatwaves put stress on buildings and other infrastructure, including roads and other transport links. In cities, the 'urban heat island' can increase the risk of heat related deaths.
• Warm weather can raise surface water temperatures of reservoirs used for industrial cooling. In addition, this could impact local eco-systems, improving the growing conditions for algae and potentially harmful micro-organisms in water courses.
• Heatwaves can have an impact on agricultural productivity and growing seasons.
• High temperatures can have implications for energy security. Peak energy demand due to demand for cooling can exceed incremental increases on base load in addition to the risk of line outages and blackouts.
• Human health can be affected by warmer periods. For example, urban air quality and disease transmission (e.g. malaria and dengue fever) can be impacted by higher air temperatures.
• Wildfire risk is elevated during prolonged warm periods that dry fuels, promoting easier ignition and faster spread.
• Permafrost and glacial melt regimes as impacted by warm periods.
• If our data suggests that there are existing hazards associated with high temperatures in the region, they will be highlighted elsewhere in the report. This may include existing wildfire risks as well as areas potentially impacted by permafrost and glacial melt.

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LOW RISK

PRECIPITATION DECREASE

Would a decrease in precipitation require modifications to the design of the project in order to successfully provide the expected services over its lifetime?

Chosen Answer

No - modifications are not required.

The design of the project would be unaffected by decreases in precipitation.

ACCLIMATISE COMMENTARY

1. What does this mean for the design of my project?

• Even though you have suggested that designs would not be affected by a decrease in precipitation, it is worth considering existing precipitation related hazards in the region where the project is planned.

2. How could reduced precipitation affect the project even without future climate change?

• Decreased seasonal runoff may exacerbate pressures on water availability, accessibility and quality.
• Variability of river runoff may be affected such that extremely low runoff events (i.e. drought) may occur much more frequently.
• Pollutants from industry that would be adequately diluted could now could become more concentrated.
• Increased risk of drought conditions could lead to accelerated land degradation, expanding desertification and more dust storms.
• If our data suggests that there are existing hazards associated with decreased precipitation in the region, they will be highlighted elsewhere in the report. This may include water availability and wildfire.

3. What does the science say could happen by the 2050s?

• Climate model projections do not agree that annual average precipitation will decrease in the project location which could indicate a relatively high degree of uncertainty (see the section "Model agreement and uncertainty" in "Help and glossary" at the end of this report). On the other hand, this could also mean precipitation patterns are not expected to change or may even increase (see elsewhere in the report for more details of projections related to precipitation increase).
• If you want to know more about projected changes in the project location across a range of GCMs and RCPs please refer to USGS's CMIP5 Global Climate Change Viewer for detailed maps.

4. What next?

1. See the section "Further reading" in "Help and glossary" at the end of this report which lists a selection of resources that provide further information on a changing climate.
2. Click here for the latest news and information relating to water and climate change.

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The sections above will provide details on all high and medium climate hazard risks from Aware™ where these are suggested by the climate sensitivities of the project and / or the underlying data. Selected Low risks may also be detailed. Local conditions, however, can be highly variable, so if you have any concerns related to risks not detailed in this report, it is recommended that you investigate these further using more site-specific information or through discussions with the project designers.

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Project Geological Hazard Risk Ratings

Below you will find the overall geological hazard risk level for the project together with a radar chart presenting the level of risk associated with each individual geological risk topic analysed in Aware™. Projects with a final "High risk" rating are always recommended for further more detailed geological risk analyses.

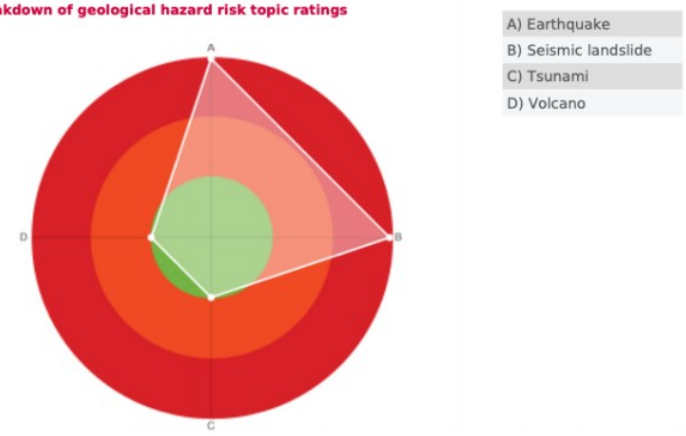
The radar chart provides an overview of which individual risks are most significant. This should be used in conjunction with the final rating to determine whether the project as a whole, or its individual components, should be assessed in further detail. The red band (outer circle) suggests a higher level of risk in relation to a risk topic. The green band (inner circle) suggests a lower level of risk in relation to a risk topic.

In the remaining sections of this report more detailed commentary is provided. Information is given on existing geological conditions and associated hazards. A number of questions are provided to help stimulate a conversation with project designers in order to determine how they would manage geological risks at the design stage. Links are provided to recent case studies, relevant data portals and other technical resources for further research.

Final project geological hazard risk ratings

High Risk

Breakdown of geological hazard risk topic ratings



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13 EARTHQUAKE

HIGH RISK

ACCLIMATISE COMMENTARY

• Our data suggest that the project is located in a region where Peak Ground Acceleration (PGA) of >31 cm/s may be expected from a 250y return period event, potentially leading to moderate to heavy damage. This is based on post-processed data from International Centre for Numerical Methods in Engineering (CIMNE) and INGENIAR Ltda (GAR15).

• Earthquake risk is dependent on several factors including the characteristics of the hazard, exposure of assets and population to the hazard, and vulnerabilities:
- Distance away from the epicentre
- Depth of the earthquake
- Local geology
- Duration of the shaking
- Population density
- Land use characteristics
- Design standards, construction quality and materials, and maintenance standards of infrastructure and assets.
• Up to date information on seismic risk worldwide is available online, for exampl UNEP / UNISDR's Global Risk Data Platform, GEM Foundation's OpenQuake Platform and OpenQuake tools.

1. What does this mean for the design and construction of my project?

• If earthquakes are identified as a potential problem for the project, it is recommended that:
- More localised information is collected earthquake history and any associated secondary hazards (liquefaction, landslide, tsunami, fire)
- Information is collected on local building regulations and how they factor earthquake risk considerations
- Soil investigations are conducted, including assessment of physical characteristics, such as liquefaction potential, stability of slope etc
- The project design and construction features ensures that the structures can adequately resist seismic forces during earthquakes
- Where the proposed infrastructure will act as a critical facility, such as, major dams, power plants etc., a more detailed earthquake risk assessment is undertaken to inform the project siting, design and construction process if necessary.

2. As a starting point you may wish to consider the following questions:

Q1 Would the expected performance of the project be impaired by earthquakes?
Q2 Does the project team have a good understanding of the earthquake risk in the area, including past earthquakes, soil characteristics, local building regulations?
Q3 Is there a plan to assess seismic risk to project design, construction and operation?
Q4 Do the project design standards incorporate features to resist seismic forces?
Q5 If the proposed infrastructure is likely to be used by as an evacuation center and/or is a critical facility, will the project include emergency management plans

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HIGH RISK

SEISMIC LANDSLIDE

ACCLIMATISE COMMENTARY

• Our data suggest that the project is located in a region with a recorded level of at least "Low risk" or above from seismically triggered landslide events. This is based on post-processed data from the International Centre for Geohazards /NGI for the Global Assessment Report on Risk Reduction (GAR).
• Landslide risk is locally influenced by other factors, for example local slope and vegetation conditions, long term precipitation trends and human actions, such as excavation of slopes, deforestation, mining etc.
• Up to date information on seismically triggered landslide risk worldwide is available online, for example UNEP / UNISDR's Global Risk Data Platform.

1. What does this mean for the design and construction of my project?

• If seismically triggered landslides are identified as a potential problem for the project, it is recommended that:
- More localised information is collected on past landslides and highly susceptible areas
- Information is collected on local land use and building regulations, such as landslide zonation ordinances
- The project siting, design and construction features ensure that the structures are stable and will not increase landslide risk

2. What the science says could happen in the future and what does this mean for the design and construction of my project?

• Climate change is projected to influence the frequency and intensity of rainfall events and changes in vegetation cover. This may impact on slope stability, exacerbating the risk of seismically triggered landslides. If our data suggests that there are existing landslide hazards associated with heavy precipitation in the region, they will be highlighted elsewhere in the report.
• Existing engineering design and construction may not take into consideration the impact of climate change on exacerbating the risk of seismically triggered landslides. See "Critical thresholds" in the "Help & glossary" section for further details on how a changing climate can impact on critical thresholds and design standards.

3. As a starting point you may wish to consider the following questions:

Q1 Would the expected performance and maintenance of the project be impaired by landslides?
Q2 Will assets or operations associated with the project be in elevated areas or close to slopes?
Q3 Is there a history of landslides and seismic events in the local area where the project is proposed?
Q4 Are there any plans to integrate climate change factors into a landslide risk assessment for where the project is being undertaken?
Q5 Does the project siting considers landslide risk to ensure the landslide hazard will not be increased due to construction of the infrastructure?

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Annex3. Land Acquisition and Resettlement Due Diligence Report

Land Acquisition and Resettlement Due Diligence Report

for Package 3 of Obigarm - Nurobod Road Project

Analysis of Potential Impact on Land Usage/Ownership

Deliverable 3 (ESIA Report Attachment)

Prepared by BARS Consulting LLC

August 2023

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Objective and Tasks

An international social safeguards (resettlement) specialist is engaged to carry out due diligence on the Alternative 1 Pre-stressed Concrete (PSC) Girder Bridge. This output will include preparing safeguards documentation for social aspects of the project consistent with AIIB ESP(2019)

To conduct the social safeguards (resettlement) due diligence, the following elements are considered necessary:

- Assist the Bars Consulting LLC finalizing the Addendum of Environmental and Social Impact Assessment covering the Environmental and Social aspects relating to the Package 3 of the project;
- Assist the Bars Consulting LLC finalizing the Land Acquisition and Resettlement Due Diligence Report after the final alignment will be chosen;
- Liaise with local social expert hired by Bars Consulting LLC;
- Liaise with technical and environmental safeguards experts as directed by the employer, in cooperation with the Bars Consulting LLC.

Land Acquisition and Resettlement Due Diligence

According to the preliminary information the project AOI is determined 100 m away from each side of the edge of ROW, also 100 m radios is determined around proposed quarries, borrow areas, construction facilities and labor camps, , locations of which are not known yet. During the field visit conducted on November 11, 2022 by local social consultant and desk study provided by international social consultant was considered if project will have an influence of private or privately used land, business or farming activities of any kind of ownership, namely if there are grazing areas used by local community and if the income from cattle-breeding is the main source of income for locals. The preliminary study shows that land acquisition and resettlement could be avoided. However, in order to avoid any kind of negative impact on land use and farming, present Due Diligence report is prepared and local community and other stakeholders' consultations were held. the results are presented in chapters below.

Scope of Work and Methodology

Review of the Resettlement Documents

It is important to assess the resettlement risks during the land acquisition and resettlement due diligence field study process. To address the tasks specified for the RDDR, first of all it is required to review the related documents available at present: Therefore, relevant documentation and related technical plans were requested from local Committee for land management, namely: existing plans and drawings for land ownership and usage (if any), as well as land purpose and reviewed accordingly.

Site visits

Scope of several site visits conducted in February - March 2023 as well as in July 18, 2023 are required to check that all potential resettlement impacts are captured in the RDDR, as well as compliance of the RDDR preparation process with the requirements of the Environmental and Social Policy (ESP) (2019) . During the site visits the Local Social Specialist has made focus on following issues during his limited field works:

- Analysis of the project design documents and identification of any additional direct or indirect impacts, like potential land take impacts for bridge construction or other related infrastructure; limitation of access to the land plots, public utilities and public places potential noise, dust impacts etc.
- Conduct the individual and public consultations and ensure compliance of consultation process

During the site visits the following information was obtained:

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1. During the site visit the territory of farm "SOHIB KAND" (Dekhan farm) was observed and the and meeting with representative of farm Mr. Kosimov conducted, together with the land surveyors of the district, he confirmed that his farm is far from the bridge construction zone and the project does not affect the farm's land. The area of the farm is 63 hectares.

2. During the site visits and consultations, it was mentioned by the member of the local committee of the Jamoat Safedchashma that the local population used a small part of the land under the project impact as pasture. (The total size of the pasture is 2500 Ha, the distance from the settlement is about 5 km). During the soviet period the construction of the bridge was started and embankments (About 700 m long) from both sites were built. After the soviet period this land was on the balance of the reserve fund of the Nurobod district. The population was informed by the local khukumat (authorities) about the future plans to rebuild the bridge.

Currently there is ongoing construction of the temporary bridge on this territory and an alternative pasture (the same size in places named "Chavsha") was allocated for the local population which is 5 km far away from the temporary bridge.

No other concerns or suggestions were raised by local authorities or population during the site visits.

Picture 1: Photo of temporary bridge taken from Jamoat Safedchashma's site. This bridge will be dismantled after the construction of the main bridge:

Picture 2: Photo of Embankments

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Socio-Economical Baseline Information Obtained during the Field Visits and Desk Study in Project Area

Nearest Settlements: According to alternative 1 The nearest residential houses are located about 700m away from the start point of the project at the left bank and about 500m away from the right bank. In the town of Darband, the nearest settlement to the bridge is the 7th mahala. In the 7th mahala, the population is 421 people. of which 220 people. Men and 201 women. Number of households is 93.

In the Jamoat "Safedchashma", the nearest settlement to the proposed bridge is the village of Dikhi-Gulmon. 146 persons live in Dikhi-Gulmon. Of these, 75 men and 71 women. Number of farms is 14.

Agricultural Activities in Nearest Settlements: Agriculture in the jamoats "Safedchashma" and "Darband" consists of crop production and cattle-breeding. In "Darband" Jamoat in terms of the cattle-breeding there are the following data obtained: Cattle 322 heads. Small cattle 250 heads. poultry 226 heads. Bee family 132 families.

Only 21.8 ha of agricultural land are household plots, the remaining 225 hectares are for construction and other purposes. There are no gardens in the area under the potential project impact.

As for the “Safedchashma” jamoat, in terms of cattle-breeding, the following data are available: (Cattle 4257 heads, small cattle 14 951 heads. horses 86 heads poultry 9759 heads. Bee family 736 families). Agricultural land 3,942 ha including (irrigated 295 ha and non- irrigated 435 ha). In the direction of garden production, there are the following orchards: (Pear 8.5 ha, Apple 83.14).

On the territory of Jamoat Safedchashma there are pastures on the territory of 2.6 hectares.

Industry: There are no industrial facilities on the territory of the project area and in surrounding communities.

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Household Expenses and Income from Formal and Informal Types of Economic Activity: The main source of income for the population of the project area is remittances from labor migrants and from agricultural and cattle-breeding activities. The data was revealed during a social survey conducted in February 2023. The randomly selected HHs were interviewed based on an especially elaborated semi=structured questionnaire.

The main household expenditures are food including food for cattle and poultry, then clothing, school goods etc.

Household Organization: Households in the project area have many children, in most of the surveyed families there were more than 4 children per family In every family, at least one member (mostly the head of family) is a labor migrant.

Access to social services (education, healthcare, communication, transportation system,): In the " Darband " there is one Helthcare center and one medical center in in Jamoat "Safedchashma"

There is no public transport in the project area. Mostly there are private taxis and minibuses. Also, due to the construction of the Obigarm Nurobod road (Phase 2), there is no intensity of the traffic flow on the existing roads of the project area.

Cultural heritage, archeology, objects and places of special interest (for example, cemeteries, mosques and monuments, etc.).

Jamoat Darband: Historical sights do not exist in this settlement. There is one cemetery and one big mosque.

Jamoat Safedchashma: Historical sights do not exist in this settlement There are 7 mosques and a cemetery.

Tajikistan Constitution, Law/regulation on Land Acquisition, Resettlement and Compensation

The Constitution of the Republic of Tajikistan is the main legal document which guarantees citizen's rights. Article 13 states that land, bowels of the earth, [i.e. mineral resources], water, airspace, animal and vegetable kingdoms, [i.e., flora and fauna], and other natural resources are owned by the state, and the state guarantees their effective use in the interests of the people. Furthermore, Article 12 states that the economy of Tajikistan is based on various forms of ownership and the state will guarantee freedom of economic activity, entrepreneurship, equality of rights, and the protection of all forms of ownership, including private ownership.

> The legal basis for state acquisition of private property for public works is outlined in Article 32 which states "…the property of an individual is taken away only on the basis of the law, with the consent of the owner and to meet the requirements of the state and society, and with the state paying full compensation."

Provisions regulated by the Land Code

In August 2012 amendments to the Land Code that enable legal sales and lease transactions for land use rights were approved21F[19]. The Land Code also includes changes to the provisions related to land acquisition [20].

The revocation/allotment of lands and resettlement envisages compensation for losses incurred by land users or those with other registered rights to the land when the land plot is revoked for state and public needs.

The state may revoke land plots for state and public needs from land users after:

[19] Law 891, dated August 2012, article 19.
[20] Articles 37-45.

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a. allocating a land plot of equal value
b. constructing housing and other buildings with the same purpose and value, in a new location for the natural persons and legal entities to whom the land plot had been allocated, in accordance with established procedures
c. fully compensating for all other losses, including lost profits, in accordance with the legislation of the Republic of Tajikistan.

Upon the revocation of land plots for state and public needs, all losses shall be calculated according to the market price, which shall be defined by taking into consideration the location of the land plot, and compensation shall be paid to the persons/legal entity whose land has been taken away. Termination of the right to use a land plot, for state and public needs, can be carried out after allocation of an equal land plot and compensation of other expenses is provided by part one of the present article. (L.C. Article 41; In the Republic of Tajikistan Law edition dated 1 August 2012, No. 891).

The procedure for the compensation of losses to land users and losses arising from the removal of land from circulation is regulated by Article 43 of the Land Code edition dated 1 August 2012, No. 891.

In the event of revocation of a land plot for state and public needs, compensation for losses to land users and others with registered rights to the land, and losses connected to the removal of land from circulation, shall be made by the natural/legal persons whose activity led to the revocation.

In the event of withdrawal of a land plot for state and public needs, the procedure for compensation of losses to land users and others with registered rights to the land, and losses connected to the removal of land from circulation, shall be defined by the Government of the Republic of Tajikistan (In RT Law edition dated 5 January 2008, No. 357).

Upon termination of the rights to a property, the property will be assessed based on its market value (Article 265 Civil Code).

Land users should be notified in writing about land revocation by the local executive government body no later than one year before the pending withdrawal of the land (Article 40. Land Code of the Republic of Tajikistan Law edition dated 1 August 2012 no. 891).

In the event that international agreements recognized by the Republic of Tajikistan establish other rules than those contained in the Land Code of the Republic of Tajikistan, the rules of the international agreement shall be applied (Article 105, LC of the RT edition dated 28 February 2004 No. 23).

The Land Code of 1997 is the core legal document related to land acquisition. It has been updated a few times and most recently in August 2012. Article 2 of the Land Code states that *"land is an exclusive ownership of the State…* [but]... the State *guarantees its effective use in the interests of its citizens".* However, Articles 10-14, the Land Code outlines land title as being of long-term, short-term, and inherited land use entitlement. Article 14 of the LC of the RT also states that land users may lease land plots by agreement (In the Republic of Tajikistan Law addition dated 1August 2012 No. 891).

Article 24 of the Land Code describes the allocation of land for non-agricultural purposes, and provides that when choosing a suitable location for such land uses, land not suitable for agriculture should be favored. The same principle is stressed by Article 29, which discourages the use of high yielding agricultural land for non-agricultural use. However, Article 29 also allows for allocation, and appropriating of agricultural land for *"other very important State objects".*

In accordance to Article 19 of the Land Code, the land right users may:

i. execute civil-legal transactions (buying-selling, gift, exchange,

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mortgage and other) with allocated (acquired) use right to a land plot with a right to alienate it independently without interference of executive government bodies, except for provisions of present Code; (In the Republic of Tajikistan Law edition dated 1 August 2012 No. 891)

ii. lease the land plot
iii. establish private (based on consent) servitude to a land plot; (In edition dated 1 August 2012 No. 891)
iv. mortgage the right to a land plot
v. receive compensation in the event of withdrawal of the right to use the land plot for state and public need in accordance with Article 41 – 43 of the present Code.

Compensation for land which belongs to the State but is allocated and essentially leased to users by each Hukumat, is divided between the Hukumat and the user according to the following proportion:

i. 40% to the Hukumat, which will no longer derive income from taxes and leases for the portion of the land being acquired
ii. 60% to the land user, who suffers a reduction in his/her income-generating asset.

The compensation received by the Hukumat is used for the management, construction, and maintenance of local infrastructure. The land user also receives compensation for lost crops based on the provisions outlined in the entitlement matrix.

AIIB Environmental and Social Policy (ESP), standard ESS-2

The three important elements of ADB's involuntary resettlement policy are (i) compensation to replace lost assets, livelihood, and income; (ii) assistance for relocation, including provision of relocation sites with appropriate facilities and services; and (iii) assistance for rehabilitation to achieve at least the same level of well-being with the project as without it. For any AIIB operation requiring involuntary resettlement, planning is an integral part of project design, to be dealt with from the earliest stages of the project cycle, taking into account the following 12 key policy principles for involuntary resettlement.

These can be summarized as follows:

I. Screen the project early on to determine past, present, and future involuntary resettlement impacts and risks. Determine the scope of resettlement planning through a survey and/or census of displaced persons, including a gender analysis, related to resettlement impacts and risks.

II. Carry out meaningful consultations with affected persons, host communities, and concerned non-government organizations. Inform all displaced persons of their entitlements and resettlement options. Ensure their participation in planning, implementation, monitoring and evaluation of resettlement programs. Pay particular attention to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, Indigenous Peoples, and those without legal titles to land, and ensure their participation in consultations. Establish a grievance redress mechanism to receive and resolve the affected persons' concerns. Support the social and cultural institutions of displaced persons and their host population. Where involuntary resettlement impacts and risks are highly complex and sensitive, compensation and resettlement decisions should be

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preceded by a social preparation phase.

III. Improve, or at least restore, the livelihoods of all APs through (i) land-based resettlement strategies when affected livelihoods are land based (where possible) or cash compensation at replacement value for land when the loss of land does not undermine livelihoods, (ii) prompt replacement of assets with access to assets of equal or higher value, (iii) prompt compensation at full replacement cost for assets that cannot be restored, and (iv) additional revenues and services through benefit sharing schemes where possible.

IV. Provide physically and economically displaced persons with needed assistance, including the following: (i) if there is relocation, secured tenure to relocation land, better housing at resettlement sites with comparable access to employment and production opportunities, integration of resettled persons economically and socially into their host communities, and extension of project benefits to host communities; (ii) transitional support and development assistance, such as land development, credit facilities, training, or employment opportunities; and (iii) civic infrastructure and community services, as required.

V. Improve the standards of living of the displaced poor and other vulnerable groups, including women, to at least national minimum standards. In rural areas provide them with legal and affordable access to land and resources, and in urban areas provide them with the relevant income sources and legal and affordable access to adequate housing.

VI. Establish procedures in a transparent, consistent, and equitable manner if land acquisition is through negotiated settlement to ensure that those people who enter into negotiated settlements will maintain the same or better income and livelihood status.

VII. Ensure that APs without titles to land or any recognizable legal rights to land are eligible for resettlement assistance and compensation for loss of non-land assets.

VIII. Prepare a resettlement plan elaborating on APs' entitlements, the income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget, and time-bound implementation schedule.

IX. Disclose a draft resettlement plan, including documentation of the consultation process in a timely manner, before project appraisal, in an accessible place and

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form and language(s) understandable to affected persons and other stakeholders. Disclose the final resettlement plan and its updates to affected persons and other stakeholders.

X. Conceive and execute involuntary resettlement as part of a development project or program. Include the full costs of resettlement in the presentation of the project's costs and benefits. For a project with significant involuntary resettlement impacts, consider implementing the involuntary resettlement component of the project as a stand-alone operation.

XI. Pay compensation and provide other resettlement entitlements before physical or economic displacement. Implement the resettlement plan under close supervision throughout the project implementation.

XII. Monitor and assess resettlement outcomes, their impacts on the standards of living of displaced persons, and whether the objectives of the resettlement plan have been achieved by taking into account the baseline conditions and the results of resettlement monitoring. Disclose monitoring reports.

AIIB Environmental and Social Policy (ESP), standard ESS-2 distinguishes three categories of APs, with variable compensation needs:

a. Legal APs: APs with formal legal rights to land lost in its entirety or in part.
b. Legalizable APs: APs without formal legal rights to land lost in its entirety or part but who have claims to such lands that are recognized or are recognizable under national law and.
c. Non-legal APs: APs who have neither formal legal rights nor recognized/ recognizable claims to land lost in its entirety or in part. Encroachers and squatters fall in this category.

The APs have to be informed about the essence and meaning of the cut-off date and advised that this is the completion date for the census, demarcation, land surveys, socioeconomic survey of project affected households, and inventory of project affected assets. The APs have to be aware that any person who settles in the affected areas, or erects any fixed assets, such as fences, auxiliary structures, buildings of residential and/or commercial designation, perennials (decorative and/or fruit bearing trees), and woodlots or other fixed or movable assets, after the cut-off date will not be eligible for any compensation. However, they will be given sufficient advance notice by a request to vacate premises and dismantle affected structures prior to project implementation Compensation for lost land may be in the form of replacement land (preferred option if feasible) or in cash.

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can be valued based on market rates or, in the absence of land markets, through other methods (i.e. land productivity or reproduction costs)[21].

Compensation is to be provided at "full replacement cost". This includes: (i) transaction costs; (ii) interest accrued; (iii) transitional and restoration costs; and (iv) other applicable payments, if any. Compensation for all other assets is to be provided in cash at replacement cost without deductions for amortization, salvaged materials and transaction costs

The following core involuntary resettlement principles were adopted for this Project:

i. land acquisition, and other involuntary resettlement impacts will be avoided or minimized by exploring all viable alternatives in the Project design
ii. consultations with APs on compensation, disclosure of resettlement information to APs, and participation of APs in the planning and implementation of rehabilitation measures will be ensured
iii. vulnerable groups will be provided with a special assistance
iv. payment of compensation to affected persons including non-titled persons (e.g., informal dwellers/squatters, and encroachers) for acquired assets (except for illegally used land) at replacement rates
v. payment of compensation and resettlement assistance prior to the contractor taking physical possession of the land and prior to the commencement of any construction activities
vi. provision of income restoration and rehabilitation, and
vii. establishment of appropriate grievance redress mechanism.

Institutional Arrangements

The planning, preparation and implementation of the LARDDR involves distinct processes and different parties. This chapter details the core agencies and organizations involved, as well as their roles and responsibilities during the LARDDR preparation activities.
The core agencies and organizations involved in the LARDDR process are: ADB, Ministry of Transport, Project Implementation Unit for Road Rehabilitation (PIURR), Ministry of Agriculture, State Committee for Land management and Geodesy (SCLMG), 'Nurband', District Authorities, Local Executive Government Districts (Hukumats), Jamoats, and other state agencies.

Asian Infrastructure Investment Bank (AIIB)

The AIIB is the funding agency of the Project. In addition to funding, AIIB regularly reviews the Project and LARDDR preparation and approval.

The Ministry of Transport (MoT) is the Executing Agency.

The MoT has the overall responsibility for the Project in areas such as preparation, implementation and financing of all LAR tasks (if any), cross agency coordination, management, monitoring and evaluation of all project implementation aspects, including procurement of goods, services, and works on the projects.

Ministry of Agriculture

The Ministry of Agriculture has the responsibility, together with the local authorities, to provide the data on cropping patterns in the Project area, productivity of lands and other data..

State Committee for Land management and Geodesy (SCLMG)

During the impact assessment, when land user data is concerned, land specialists from SCLMG subdivisions at district and Jamoat levels provide information on ownership/use rights and propose

[21] One method accepted by AIIB in such a situation would be to provide land compensation based on land productivity or land reproduction costs.

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the replacement land plot for APs. The central office of the SCLMG, through its subdivisions deals with the transfer of land use rights from land users to the EAs.

Based on the National Law on State Registration of Immovable Property and Rights to it a Unified Registration System (URS) was created under SCLMG, which combines functions of several institutions such as Regional and Rayon offices of Bureau of Technical Inventory (BTI), the Ministry for Justice and some of the functions of local government offices into a more efficient and streamlined registration authority. There are 34 URS offices operating at district and city level in the country.

District Authorities

Hukumat

The district (Hukumat) is the local administrative body, established in all cities and rayons. The planning and implementation of any LAR activities related to land and assets is done through districts' authorities (Hukumats). This local administration has a direct link with the people through sub-districts known as *'Jamoats'* and heads of communities (Raisi Mahala). The impact assessment is verified/signed and stamped by relevant district level specialists (chief architect, head of agriculture department, head of land management committee, etc.) Based on the list of APs, the district level authorities prepare a request letter for compensation payment and send it to the EA for further action.

In relation to land and immovable property administration, the Hukumat assists the concerned departments in resolving issues such as allocation of land use rights, and decisions on acquisition of land use rights and allocation of alternate sites for resettlement.

Jamoat

The Jamoat is the sub-district level local authority and is instrumental during impact assessment as it identifies/ verifies land users and their type and ownership/use status. The Jamoat also re-confirms the names of APs, Jamoat in in charge of registration of titles to land use and land-lease agreements; keeping of household registers; and control over land protection and issuance of land use rights.

City and Town Local State Executive Authorities

These are the bodies of local government in the cities and towns. Their functions in relation to LARDDR are basically the same as those of district authorities and depending on the scope of the project entailing LAR, the relevant critical decisions may be taken either at the city/town level or by the national Government.

Public Consultations

The IA will have lead responsibility for implementation of the Program and consultations with project surrounded communities. They will receive all information about the project, steps and all outcomes and results, as well as any kind of positive and negative impacts.

The aim of consultations was to involve the stakeholders in the decision-making process, especially the people who are either directly benefiting from, or affected by the Project. Communications will be conducted mostly in the Tajiki (65% of the general population) and Russian languages. The started at an early period of ESIA preparation and will continue during the Project implementation and at any point when required.

During the site visits the Local Social Consultant conducted individual and group consultations with the local population, farm owners and governmental authorities. Consultations covered a number of

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meetings in February 2023 and in July 18, 2023. The minutes of the meeting are attached in Annex 1 below.

Conclusion

As a brief summary of the conducted due diligence assessment, the International Social Consultant presents following main conclusions:

1. There is no impact on land or assets identified during the: desk study, site visits and public consultations, therefore no compensation package and relevant LARP Document was elaborated based on the findings.
2. The pasture, which was used by local population nearby Jamoat "Safedchashma" was fullu replaced.
3. However, if during the construction or operation period there will be any kind of impact on land ownership, usage, farming or other activities, etc. identified, the relevant LARP based om AIIB Policy and AIIB Environmental and social framework has to be developed, disclosed and implemented. The tentative Entitlement Matrix for potential land acquisition and resettlement impact is provided below:

If, after the finalization of detailed design or during the construction period any kind of impact or unforeseen impacts will be identified, the detailed measurement survey and Inventory of losses should be conducted by appropriate, experienced and technically equipped specialists. The scope of work for LARP Preparation may include (But not limited):

- Preparation of the cadastral drawings for affected land plots not addressed in RAP
- Data collection for the census and inventory of losses for affected land plots
- Preparation of the social profile of affected AHs
- Valuation of land and assets
- Meaningful Public consultations

Table 2: Entitlement Matrix: **Project-specific Entitlement Matrix (tentative, some provisions can be added on later stages if any kind of impact will occur during the construction or operation phases)**

No.	Asset	Affected Person/ Affected Entity	Compensation Entitlements
Permanent Loss			
1	Agricultural land (all losses irrespective of severity)	Individual land-use rights holders	Cash allowance for loss of land use rights equal to net income in the last 5 years generated from the affected land area, at market rate, at the time of taking; or Provision of alternative land plot of equal value/productivity to the lost plot. If the remaining portion of the plot to be taken is too small to use, the whole plot is compensated or exchanged.
		Cooperative land-use rights holders (dehkan farms – entities)	Cash allowance for loss of land use rights equal to net income for the last 5 years generated from the affected land area at market rate at time of revocation; or Provision of alternative land plot of equal value/productivity to the lost plot. If the remaining part of the plot to be taken is too small to use, the whole plot is compensated or exchanged.
			Rental allowance in accordance with the

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No.	Asset	Affected Person/ Affected Entity	Compensation Entitlements
		Renters/ leaseholders (informal users, if any)	conditions of the rent agreement, but not less than the cost of rent for 3 months; or Continuation of rental agreement on alternative land plot or cash allowance for the lost income equivalent to 1 year of average crop productivity. Provision of opportunity to lease a plot on state land. Relocation allowances, if applicable.
2	Residential and commercial land	Owners	Cash allowance for loss of land use rights in cash equal to current annual land lease rates at the time of acquisition multiplied by 25; or Provision of alternative land plot of equal value/productivity (similar conditions and facilities) to plot lost. If the residual portion of the plot to be taken is too small to use, the whole plot is compensated or exchanged, in agreement with the owner.
		Renters	Rental allowance in accordance with the conditions of the rental agreement, but no less than the cost of rent for 3 months, or continuation of the rental agreement on an alternative land plot.
		Informal users (if any)	Cash compensation, at replacement cost, for the improvements (fence, trees, sheds) on the affected land. Provision of opportunity to lease a plot on state land. Relocation allowance if applicable.
3	State land (used by APs)	Informal users (ROW occupiers - people who extend their fences towards the road and make some improvements such as auxiliary structures, trees, sheds)	The improvements made by APs are compensated in cash at replacement cost in accordance with the relevant category under this EM.
4	Buildings and structures	Owners of structures including “informal”	Cash compensation at replacement rate for affected structure/other fixed assets (without deduction of depreciation, taxes, costs for salvageable materials and other transaction costs). All buildings and structures will be compensated in their entirety; or According to the owner’s choice, if feasible, a building for building/structure for structure exchange. No project affected structure (residential, commercial, auxiliary) will be demolished until AP has fully vacated the building, collected salvaged materials and signed receive-

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No.	Asset	Affected Person/ Affected Entity	Compensation Entitlements
			delivery act with IA.
		Renters	Rental allowance in accordance with the conditions of the rental agreement, but not less than cost of rent for 3 months; or Continuation of the rental agreement for an alternative building/structure.
5	Crops	All APs, including "informal" users	Cash compensation equal to gross income generated on the affected land area for 1 year at market rate at time of revocation. No compensation for land will be paid.
6	Fruit trees	All APs, including "informal" owners of trees cultivated in state land	Compensation reflecting income replacement. Cash compensation for productive trees based on the net market value of 1 year of income multiplied by the number of years needed to grow a tree to a similar level of productivity, plus purchase of saplings and starting materials.
	Non-fruit trees		Cash compensation based on wood volume x market value of wood. APs will be eligible to take cut timber, and dispose logged trees themselves. Construction company ensures free logging.
7	Business[50] and employment (temporary and permanent)	Permanently affected Business Owner	Cash compensation equal to 1 year's net income (lost profits) plus cost of lost certificates/licenses/patents. The income is calculated based on the official tax declaration, or (if tax declaration is unavailable) it is accepted as the official monthly average wage defined by GoT. An average monthly salary defined by GOT by the period of impact multiplied by 12. loss of main structure-building used for commercial activities is qualified as permanent impact to business with 12 months expected stoppage of business.
		Temporarily Affected Business Owner	The income is calculated based on the official tax declaration, or (if tax declaration is unavailable) it is accepted as the official monthly average wage defined by GoT.
			Temporary stoppage of business will be compensated as one-time allowance that equals to average monthly wages (defined by GoT based of period of impact) multiplied to number of months of

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No.	Asset	Affected Person/ Affected Entity	Compensation Entitlements
			expected business stoppage. Under this LARP cash compensation for temporary stoppage of business varies between 3 to 6 months according to expected actual stoppage defined on the basis of impact type, such as: a) Permanent loss of supplementary structures to be reinstated on the same land parcel: 6 months b) Impact to fences and other improvements and expected short term stoppage of business operations during actual civil works along the road: 3 months
		APs (workers of affected businesses)	Workers indemnity for lost wages equal to 3 months' income. For temporary loss of employment, indemnity for lost wages for the duration of impact if less than 3 months. APs losing job will I receive cash compensation equal to 3 months of the official monthly average wages defined by GoT based of period of impact) multiplied by 3.
8	Relocation	Physically displaced APs regardless of type of impact (household who have assets/belongings to move from the affected land plot, including businesses)	APs/AHs and /or affected businesses in need to transport their movable assets, belongings and /or equipment will receive transportation allowance (cost of labor and vehicle rent to transport materials of the house/business structures to a new location). Communal and site preparation cost for the alternative land plot (including connection to power grid, water supply system, installation of latrine etc.). All APs/AHs subject to physical relocation or economic displacement due to loss of structures and assets are provided with sufficient time (from 3 to 12 months depending on their characteristics and needs) to vacate compensated assets. Prior to commencement of civil works the IA will conducts site inspection to confirm site clearance. IA will provide all necessary technical assistance to ensure all APs/AHs in need are timely and smoothly relocated (special care will be given to vulnerable and severely affected AHs).
		APs losing more that 10%	Severity/livelihood rehabilitation allowance

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No.	Asset	Affected Person/ Affected Entity	Compensation Entitlements
9	Severely affected households	of agricultural land/income resources, APs needed to physically relocate due to loss of home or business.	in the form of cash compensation equal to the official monthly average wage for 3 months.
10	Vulnerable households	APs receiving government assistance for poor (AHs below poverty line), female-headed households with dependents, elderly households with no means of support, AHs headed by disabled person or other AHs with disabled member; landless people; households without security of tenure; ethnic minorities; and small farmers (with landholdings of 0,2 hectares or less).	Allowance equivalent to official monthly average wage for 3 months; Enrolment in Government social assistance, if not yet enrolled; Priority in project-related employment for members of vulnerable households (if at legal working age).
11	Public / Common assets		Rehabilitation/substitution in kind or in cash at replacement cost of affected items and rehabilitation of their functions. Alternative service supplied, if cut off temporarily.
Temporary Loss			
12	Temporary impacts	All relevant APs	For unforeseen and temporary impacts other than stated above, AIIB policy general principles and objectives will be used as the minimum benchmarks, and appropriate impact mitigation measures will be sought to meet them. The payment for rented land during the construction, will be based on the market price under negotiated agreement. After discontinuation of land use, the land must be restored to the original status, or as per the agreement with the land rights holder.
Unanticipated impacts			
13	Another unanticipated asset loss or impact on livelihood	All APs residing in the project corridor before the cut-off date.	Compensated as per the Project-specific Entitlement Matrix.

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Annex 4. Minutes of Meetings

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Пайнавишти

вохури бо намояндагони Кумитаи идораи замини нохияи Нуробод

ва хочагии дехконии Канд Сохиб

аз 18 июли соли 2023 **н. Нуробод**

Иштирок намуданд:

Сулаймонов Муазамчон – Ёвари Раиси Кумитаи идораи замини н. Нуробод

Мунахваров Абдусаттор – мутахассиси пешбари Кумита

Шарис Шакирова – номояндаи Маркази татбики лоихахои тачдиди роххои Вазорати наклиёти Чумхурии Точикистон

Чумаев Мехрочиддин – хамохангсози лоихавии Ширкати машваратии ЧДММ Барс Консалтинг

Каюмова Сарвиноз – тахлилгари лоихваии Ширкати машваратии ЧДММ Барс Консалтинг

Бобоев Баходур – хукукшиноси Ширкати машваратии ЧДММ Барс Консалтинг

Сафаров Дилшод – мутахассис оид ба масоили ичтимоии ЧДММ Барс Консалтинг

Косимов Саидмурод – намояндаи хочагии дехконии Канд Сохиб

Рузномаи вохури:

Баррасии масъалаи мавҷуд будан ё набудани заминхои хочагихои дехкони ва дигар иншоотхо дар худуди минтакаи лоиха

Иштирокчини чаласа пас аз муаррифии масъалаи гузошташуда маълумоти муфассал оид ба лоиха пешниход намуда, вобаста ба чойгир будани хочагихои дехкони аз чумла х/д Канд Сохиб дар минтакаи лоихаи омодашуда

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аз чониби намояндаи Кумитаи замини нохия пурсон шуда, дар навбати худ аз онхо тасдики набудани заминхои хочагии дехкони ва дигар иншоотхо дар худуди минтакаи таъсири лоиха гирифта шуд, ки ба ягон нафар ва ё хочагихои дехконии дахлдор заминхо вобаста нашудаанд ва дар ихтиёрдории онхо мавчуд намебошад, аз он чумла Х/Д Канд Сохиб аз минтакаи лоиха дар масофаи 820 м. дур мебошад.

Сохтмони пул, ки дар доираи лоиха пешбини шудааст ба заминхои зикргардида ягон таъсири манфи намерасонад.

Масъалаи дигаре, ки дар чаласа гузошта шуд ин гайрирасми истифода бурдани заминхои дар минтакаи лоиха (130/130 аз ду чониби пули сохташаванда) мавчудбуда мебошад.

Намояндаи Кумита кайд намуд, ки аз чониби сокинон баъзе мавридхо дар мавсимхои бахору тобистон хамчун чарогох кисмати хурди замини зикршударо истифода мебурданд ва айни хол сокинон аз накшаи сохта шудани пул огох буда, вобаста ба ин чорвои худро дар мавзеи ЧАВШИ мечаронанд.

Намояндаи х/д Канд Сохиб аз руи масъалахои дар чаласа баррасишуда ягон эрод нагирифта кайд намуд, ки вокеан заминхои зикргардида аз минтакаи заминхои х/д Канд Сохиб вобаста буда берун буда, тасдик намуд, ки нисбати сохтмони лоихаи сохтмони пул ягон даъво надорад.

Сулаймонов Муазамчон

Мунахваров Абдусаттор

Шарис Шакирова

Чумаев Мехрочиддин

Каюмова Сарвиноз

Бобоев Баходур

Сафаров Дилшод

Косимов Саидмурод

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Суратҷаласа

маҷлиси аъзоёни хоҷагии деҳқонии “Қанд Соҳиб”

19 июли соли 2023 **н. Нуробод**

Иштирок намуданд:

Қосимов Саидмурод – Сардори хоҷагии деҳқонии “Қанд Соҳиб”

Рақибова Марҳабо – аъзои хоҷагии деҳқонии “Қанд Соҳиб”

Исломова Ҳуснбону – аъзои хоҷагӣ

Зиёвид Адҳам – аъзои хоҷагӣ

Мусамир Фотима – аъзои хоҷагӣ

Сафиева Саврин – аъзои хоҷагӣ (котиби ҷаласа)

Рӯзномаи маҷлис:

1. Маълумот дар бораи масъалаҳои дар маҷлиси санаи 18 июли соли 2023, оид ба зери таъсири лоиҳа мондани хоҷагии деҳқонии “Қанд Соҳиб”

Маҷлисро сардори хоҷагии деҳқонии “Қанд Соҳиб” Қосимов Саидмурод оғоз намуда, сарравал дар бораи лоиҳаи пули сохташаванда маълумоти муфассал дод. Ҳамзмон дар суханронии худ қайд намуд, ки дар ҳақиқатан лоиҳаи мазкур инкишофи оянда ва зиндагии мардуми ду ҷамоатро бисёр осон мегардонад.

Қосимов Саидмурод қайд намуд, ки сохтмони пуле, ки дар доираи лоиҳа пешбинӣ шудааст ба заминҳои дар ихтиёри хоҷагии деҳқонии “Қанд Соҳиб” буда ягон таъсири манфии худро намерасонад, зеро заминҳои хоҷагии деҳқонии “Қанд Соҳиб” дар масофаи 820 метр дур аз макони сохтмони пул ҷойгир мебошад.

Дар навбати худ аъзоёни гурӯҳ суханони сардори хоҷагиро тасдиқ намуда, розигии худро бо гуфтаҳои ӯ баён намуданд.

Рақибова Марҳабо ҳамзамон дар баромади худ қайд намуд, ки макони пули сохташаванда дуртар аз заминҳои хоҷагӣ қарор дошта, иброз дошт, ки сохтмони пул барои пешрафти хоҷагии деҳқонии “Қанд Соҳиб” басо муҳим

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арзёбӣ мегардад, зеро дар оянда хоҷагӣ метавонад маҳсулоти худро тавассути пули сохташуда ба ҷамоати ҳамсоя бо харҷи камтарин ва дар муҳлати кӯтоҳ бурда расонад.

Дар хотимаи вохӯрӣ аъзоёни хоҷагии деҳқонии "Қанд Соҳиб" иброз намуданд, ки нисбати лоиҳаи мазкур ягон даъво надоранд.

Қосимов Саидмурод

Рақибова Марҳабо

Исломова Ҳуснбону

Зиёвид Адҳам

Мусамир Фотима

Сафиева Саврин

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MINUTES

meeting with representatives of the Land Management Committee of the Nurobod district and dekhkan farm “Kand Sohib”

July 18, 2023
Nurobod

Attended:

1. Sulaymonov Muazamjon - Assistant to the Chairman of the Committee for Land Management of the Nurobod district

2. Munakhvarov Abdusattor - Leading Specialist of the Committee

3. Sharis Shakirova - Representative of the Project Implementation Unit for Road Rehabilitation Ministry of Transport of the Republic of Tajikistan

4. Jumaev Mehrojiddin - project coordinator of the Consulting company “BARS Consulting” LLC

5. Kayumova Sarvinoz - project analyst of the Consulting Company “BARS Consulting” LLC

6. Boboev Bahodur - lawyer of the Consulting company “BARS Consulting” LLC

7. Safarov Dilshod - social specialist of "BARS Consulting" LLC

8. Kosimov Saidmurod - representative of the dekhkan farm “Kand Sohib”

Agenda:

Consideration of the presence or absence of farm lands and other objects in the area of influence of the project.

After presenting the question raised, the participants of the meeting provided detailed information about the location of farms, including the “Kand Sohib” farm, in the area of the prepared project, questions were asked to the representative of the Committee for Land Management of the district, and they, in turn, confirmed the absence of farm lands and other objects in the area under the influence of the project, that the lands are not assigned to any person or the

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corresponding farms and are not at their disposal, including the “Kand Sohib” farm, which is located 820 meters from the project area.

The construction of the bridge, which is planned within the framework of the project, will not have a negative impact on the specified lands.

Another issue raised at the meeting is the informal use of land in the project area (130/130 on both sides of the bridge under construction).

The representative of the committee noted that the residents used a small part of the specified land for pastures in the spring-summer period, and at present the residents are aware of the bridge construction plan and, depending on this, graze their livestock in the CHAVSHI region.

The representative of the “Kand Sohib” farm noted that the indicated lands are actually outside the area of land owned by the “Kand Sohib” farm and confirmed that he has no claims regarding the bridge construction project.

Sulaymonov Muazamjon _____

Munakhvarov Abdusattor _____

Sharis Shakirova _____

Jumaev Mehrojiddin _____

Kayumova Sarvinoz _____

Bobaev Bohodur _____

Safarov Dilshod _____

Kosimov Saidmurod _____

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MINUTES

meeting of members of the dehkan farm of "Kand Sahib"

July 19, 2023
Nurobod

Attended:

Kosimov Saidmurod - Head of the "Kand Sahib" dehkan farm

Rakibova Marhabo - member of "Kand Sahib" dehkan farm

Islomova Husnbonu - member of the dehkan farm

Ziyovid Adham - member of the dehkan farm

Musamir Fotima - member of the dehkan farm

Safieva Savrin - member of the dehkan farm (secretary of the meeting)

Agenda:

1. Information on the issues at the meeting on July 18, 2023, regarding the influence of the project on the "Kand Sahib" dehkan farm.

The meeting was opened by the head of the dehkan farm of "Kand Sohib" Kosimov Saidmurod, and the head gave detailed information about the bridge project under construction. At the same time, he noted in his speech that this project will greatly facilitate the future development and life of the people of the two communities..

Kosimov Saidmurod noted that the construction of the bridge provided for in the framework of the project will not have any negative impact on the lands owned by the "Kand Sohib" dehkan farm, because the lands of the "Kand Sohib" dehkan farm are located at a distance of 820 meters from the bridge construction site.

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In turn, the members of the group confirmed the words of the head of the dehkan farm and expressed their agreement with his words.

At the same time, Rakibova Marhabo noted in her speech that the place of the bridge to be built is far away from the dehkan farm lands, and expressed that the construction of the bridge is considered very important for the development of the dehkan farm of "Kand Sahib", because in the future the dehkan farm will be able to transport its products through the constructed bridge. the neighboring community at the lowest cost and in a short period of time.

At the end of the meeting, the members of the dehkan farm of "Kand Sohib" expressed that they have no complaints about this project.

Kosimov Saidmurod _____

Rakibova Marhabo _____

Islomova Husnbonu _____

Ziyovid Adham _____

Musamir Fotima _____

Safieva Savrin _____

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Public Consultations (Unformal Translation)

ПРОТОКОЛ

встреча с представителями Комитета по землеустройству Нурабадского районна и фермерского хозяйства “Канд Сохиб”

18 июля 2023 г. **р. Нурабад**

Присутствовали:

1. Сулаймонов Муазамджон - Помощник председателя Комитета по землеустройству р. Нурабад
2. Мунахваров Абдусаттор – ведущий специалист Комитета
3. Шарис Шакирова - представитель Центр реализации проекта реабилитации автомобильных дорог Министерство транспорта Республики Таджикистан
4. Джумаев Мехроджиддин - координатор проектов Консалтинговой компании ООО «БАРС Консалтинг»
5. Каюмова Сарвиноз – аналитик проектов Консалтинговой компании ООО «БАРС Консалтинг»
6. Бобоев Баходур – юрист Консалтинговой компании ООО «БАРС Консалтинг»
7. Сафаров Дилшод - специалист по социальным вопросам ООО «БАРС Консалтинг»
8. Косимов Саидмурод - представитель фермерского хозяйства “Канд Сохиб”

Повестка дня:

Рассмотрение и обсуждение вопросов наличия или отсутствия земель фермерских хозяйств и других объектов в зоне влияния проекта.

После вступительной части встречи, была представлена деьальная информация о проекте, и был представлен вопрос повестки встречи, участники встречи со стороны местного хукумата (Комитета по землеустройству района) представили подробную информацию по поводу расположения фермерских хозяйств, в том числе фермерского хозяйства “Канд Сохиб”, которые на сонове данных картографии комитета

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подтвердили отсутствие в зоне воздействия проекта земель фермерских хозяйств и других объектов, а также то что находящиеся там земли не закреплены за каким-либо лицом или соответствующими фермерских хозяйствам и не находятся в их распоряжении, включая фермерского хозяйства “Канд Сохиб”, которое находится в 820 метрах от проектной зоны.

Ими было подчеркнуто что, строительство моста, которое планируется в рамках проекта, не окажет негативного воздействия на указанные земли.

Еще одним вопросом, поднятым на встрече, является неформальное использование земли в районе проекта (130/130 по обеим сторонам строящегося моста) в целях пастьбы разного скота.

Представитель комитета отметил, что жители использовали небольшую часть указанной земли под пастбища в весенне-летний период, и в настоящее время жители осведомлены о плане строительства моста и соответственно выпасают свой скот в другом месте в местности ЧАВШИ.

Далее представитель фермерского хозяйства «Канд Сохиб» отметил, что действиетельно как оказалось, земли его фермерского хазяйства находятся за пределами зоны воздействия проекта, и подтвердил, что не имеет претензий относительно проекта строительства моста.

Сулаймонов Муазамджон _____

Мунахваров Абдусаттор _____

Шарис Шакирова _____

Джумаев Мехроджиддин _____

Каюмова Сарвиноз _____

Бобоев Баходур _____

Сафаров Дилшод _____

Косимов Саидмурод _____

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Annex 5. Occupational Health and Safety Management Plan

OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT PLAN (OBIGARM - NUROBOD ROAD PROJECT IN TAJIKISTAN)

(SAMPLE)

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GLOSSARY OF ACRONYMS

HAS	Health and Safety
OH&S	Occupational Health and Safety
PFD	Personal Flotation Devices
PPE	Personal protective equipment
RE	Road Engineer
TB	Tuberculous
TCC	Traffic Control Coordinator
TMP	Traffic Management Plan

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● SUMMARY

The construction of a bridge and roads is a complex and demanding project that requires a comprehensive approach to occupational health and safety (OH&S).

The OH&S plan will cover all aspects of OH&S, from risk assessment and emergency preparedness to training and incident reporting.

The purpose of OH&S plan is to outline the measures taken to protect workers involved in the construction of the bridge and roads from injury, illness, or impacts related to hazards in the workplace. The plan outlines the roles and responsibilities of all stakeholders, as well as the procedures for monitoring and reporting OH&S incidents. Additionally, it outlines the training requirements for all employees to ensure that they are aware of the OHS risks and impacts during both the construction and operation phases of the project. The ultimate goal of the OH&S PLAN is to assess and minimize the risks and impacts to ensure a safe work environment for all employees.

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1 INTRODUCTION

Occupational health and safety (OH&S) is a vital aspect of public health focused on enhancing workplace health and safety standards. Its primary goal is to study injury and illness trends among workers and provide recommendations to mitigate the risks and hazards they face while performing their tasks.

Every occupation inherently carries health or safety risks, and it is the responsibility of every employer to ensure that their employees can perform their work with the highest level of safety possible.

The domain of OH&S establishes standards that mandate the elimination, mitigation, or substitution of hazards present at job sites. OHS programs also encompass processes and procedures aimed at minimizing the consequences of workplace incidents.

The purpose of this OH&S Plan is to establish specific requirements and protocols for ensuring worker safety and implementing site controls throughout the project work. It provides an overview of potential hazards and outlines the protective measures planned for various activities, including an emergency communications and evacuation plan.

It is essential that all individuals present on the site, including employees, contractors, and site visitors, are thoroughly briefed on the site's emergency response procedures and made aware of any potential health or safety hazards associated with on-site activities.

The objectives of this Occupational Health and Safety Plan are as follows:

- Identify the main hazards for workers that may arise during the preparation stage of the bridge and approach roads construction, during the construction and operation of the bridge structure.
- Assess these risks based on the likelihood of their occurrence and potential health consequences.
- Propose and discuss possible measures for risk prevention or mitigation.

This plan provides a concise outline of potential procedures and requirements for managing occupational health and safety on the construction site.

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1 RISK MANAGEMENT

1.1. Occupational Health and Safety Management Principles

The management of occupational health and safety (OHS) must adhere to general principles that aim to control workplace hazards, ensuring the health and safety of all employees and individuals potentially impacted by the work.

These general principles encompass several key elements, starting with the identification and assessment of hazards. Once identified, appropriate controls are implemented to eliminate or minimize risks. Regular monitoring and review of these controls are essential to maintain their effectiveness, and continual improvement of the OHS management system is pursued.

By diligently following these principles, an employer can safeguard the well-being of their workforce and others associated with the workplace.

The main steps of risk assessment are listed below:

Conduct a hazard identification: The first step in managing risks is to identify hazards that may exist in the work environment. Conduct a thorough hazard assessment of the work environment to identify any potential hazards, such as dangerous machinery, hazardous materials, or unsafe working conditions.

Evaluate the risks: Once hazards have been identified, evaluate the level of risk associated with each hazard. Consider the likelihood and severity of each hazard and determine the level of risk associated with each.

Determine control measures: Based on the hazard assessment and risk evaluation, determine the necessary control measures that need to be put in place to mitigate risks. These measures may include engineering controls, administrative controls, or personal protective equipment.

Implement control measures: Once control measures have been identified, they must be put in place. This may include providing PPE, implementing administrative controls such as safety protocols or procedures, or modifying equipment or the work environment to reduce risks.

Monitor and review: Regularly monitor and review the effectiveness of control measures to ensure that they are working as intended. Identify any new hazards that may arise and make necessary adjustments to control measures.

Train employees: Train employees on proper safety protocols, including the proper use of PPE and adherence to safety procedures.

Encourage reporting: Encourage employees to report any potential hazards or unsafe working conditions. Address any reports promptly and make necessary adjustments to control measures to ensure ongoing safety.

By following these steps, hazards can be identified and risks can be managed, resulting in a safer work environment for all employees.

1.2. Hazard Identification

Hazard identification is the process of identifying and recognizing potential sources of harm, danger, or adverse health effects within a workplace or any other setting. In the

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context of occupational health and safety, hazard identification involves systematically identifying conditions, activities, equipment, substances, or other factors that have the potential to cause harm to workers or other individuals present in the work environment.

Hazard identification can be conducted through various methods, including workplace inspections, reviewing incident and injury data, consulting with workers, and analyzing work processes. The identified hazards are then evaluated for their potential severity and likelihood of occurrence to prioritize corrective actions and implement suitable control measures. Regular hazard identification and monitoring are essential components of a proactive occupational health and safety program.

1.3. Risk assessment method

The risk ranking table is a valuable tool employed to prioritize potential hazards based on their likelihood of occurrence and potential impact. It aids in identifying the most critical hazards and determining the appropriate level of control measures to be implemented. This ensures the effective and efficient allocation of resources to address the most significant risks to workers' health and safety on the construction site.

In order to identify priorities, risk ranking table should be used.

Table. Risk Ranking to Classify Worker Scenarios

		Consequences (impact)		
Likelihood (probability)		Slightly harmful	Harmful	Extremely harmful
	High Probability (HP)	Medium risk	High risk	Extreme risk
	Medium Probability (MP)	Low risk	Medium risk	High risk
	Low Probability (LP)	Insignificant risk	Low risk	Medium risk

Consequences or severity of damage:

To determine the potential severity of the damage, the following should be considered:

➢ Body parts that will be affected.

➢ Nature of the damage, ranging from slightly harmful extremely harmful.

Slightly harmful (SH)

- Superficial damage: small cuts and bruises, eye irritation from dust.
- Discomfort and irritation: headache.

Harmful (H)

- Lacerations, burns, concussions, significant sprains, minor fractures.

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- Deafness, dermatitis, asthma, musculoskeletal disorders, illness leading to minor disease.

Extremely harmful (EH)

- Major fractures, poisonings, multiple injuries, fatal injuries.
- Cancer and other chronic diseases severely shortening life.

Probability of damage occurring:

It can be ranged from low to high, with the following criteria:

High Probability – Damage will occur always or almost always

Medium Probability - Damage will occur on some occasions

Low Probability - Damage will occur rarely

Decision making:

Once the probability and severity of the consequences is estimated, it is possible to assess the level of risk and to assign a value to the urgency with which we must address the elimination or control of these risks.

Risk Magnitude:

- Insignificant risk (IR): No specific action is required.

- Low risk (LR): There is no need to improve preventive action, but more cost-effective solutions or improvements that do not impose a significant economic burden should be considered. Periodic checks are required to ensure the effectiveness control measures is maintained.

- Medium risk (MR): Efforts should be made to reduce the risk by determining the necessary investments. Measures to reduce the risk must be implemented within a specified period. When moderate risk is associated with extremely harmful consequences, further action will be required to establish the probability of harm more accurately as a basis for determining the need for improvement in control measures.

- High risk (HR): Work should not begin until the risk has been reduced. Considerable resources may be required to control the risk. If the risk corresponds to ongoing work, the problem must be remedied in a shorter time frame than for moderate risks.

- Extreme risk (ER): Work should not start or continue until the risk is reduced. If it not possible to reduce the risk, even with limited resources, the work must be prohibited.

The construction operations should be designed according to reduction of high-risk classifications and protection of employees. Training and drills to practice the procedures and plans should be undertaken periodically to minimize the risks of occupational hazards.

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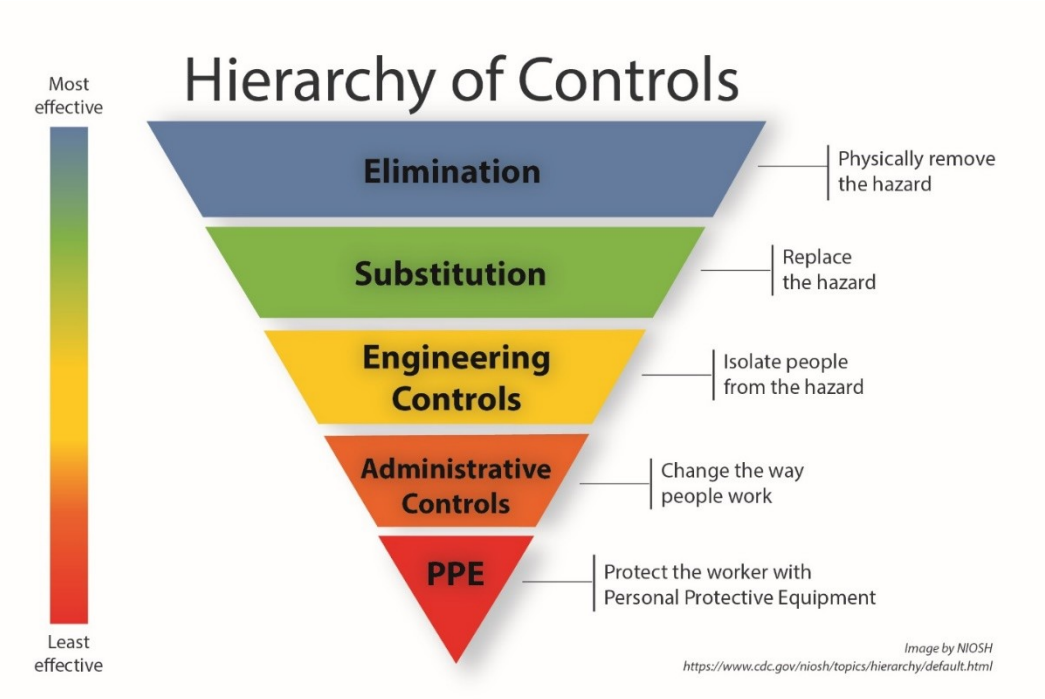
1.4. Risk Control Methods

The hierarchy of controls is a widely accepted method for managing occupational health and safety risks in the workplace. It prioritizes control measures based on their effectiveness in reducing exposure to hazards.

The hierarchy of controls typically includes the following steps:

1. Elimination
2. Substitution
3. Engineering controls
4. Administrative controls
5. Personal protective equipment (PPE)

Using this hierarchy can lower worker exposures and reduce risk of illness or injury.



Risk assessment should be an ongoing and continuous process. Therefore, the adequacy of control measures should be subject to regular review and modified if necessary. Likewise, if working conditions change, leading to variations in hazards and risks, the risk assessment will need to be reviewed and updated accordingly.

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1 PROJECT-SPECIFIC HAZARDS AND RISK ASSESSMENT

Within the scope of this OH&S Plan, a preliminary risk assessment has been conducted for each type of work related to the construction of bridge structures, and measures to reduce these risks have been proposed.

The results of this analysis were used to prioritize the risks and propose possible administrative and engineering control measures. Additionally, based on this analysis, personal protective equipment (PPE) has been recommended for use at the construction site.

1.1. Stages of work execution

To identify possible hazards, the stages of work in the construction project were observed.

Bridge construction typically involves several stages with its specific tasks. The common stages of bridge construction are listed below:

- Planning and Design: This stage involves comprehensive planning and engineering design. Engineers and architects analyze factors such as site conditions, traffic requirements, environmental impact, and structural feasibility. Detailed blueprints and construction plans are created during this phase.

- Site Preparation: Before construction begins, the construction site needs to be prepared. This may involve clearing vegetation, removing obstacles, and leveling the ground. Access roads and temporary construction facilities are also set up.

- Foundation Construction: The bridge's foundation is critical for providing stability and support. Depending on the type of bridge, various foundation types can be used, such as piling, drilled shafts, or caissons. The foundation is built below the ground surface to anchor the bridge securely.

- Substructure Construction: The substructure refers to the components that support the bridge deck, including piers, abutments, and walls. These elements are constructed above the foundation and are designed to transfer loads from the bridge to the ground.

- Superstructure Construction: The superstructure comprises the bridge deck and main load-bearing components, such as girders or trusses. The superstructure is assembled on top of the substructure and is designed to withstand the weight of traffic and other loads.

- Deck Construction: The bridge deck, which forms the roadway surface, is constructed as a part of the superstructure. Materials such as concrete, steel, or composite materials are used to build the deck.

- Surface Finishing: After the main structural elements are completed, the bridge undergoes surface finishing to ensure durability and aesthetics. This may involve waterproofing, painting, or applying protective coatings.

- Installation of Utilities and Systems: Bridges may require the installation of utilities, such as lighting, drainage systems, and safety features like guardrails and traffic signals.

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- Load Testing and Quality Control: Before the bridge is opened to traffic, load testing is performed to ensure its structural integrity. Quality control measures are implemented throughout the construction process to verify compliance with design specifications and safety standards.

- Opening and Maintenance: Once the construction is completed and the bridge is deemed safe for use, it is opened to traffic. Regular maintenance and inspections are then carried out to ensure the bridge's ongoing safety and functionality.

1.2. Hazard Analysis

This section focuses on analyzing the potential risks linked to the standard stages involved in bridge construction projects. It encompasses a thorough evaluation of the probabilities and severity of hazards, along with suggested measures to mitigate these risks. It is crucial to acknowledge that the exact stages and tasks might vary depending on the chosen construction method.

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PRE-CONSTRUCTION												
FIELD WORK												
	LIKELIHOOD			**CONSEQUENCES**			**RISK MAGNITUDE**					**PREVENTIVE MEASURES**
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Falls at the same level due to stumbling, overcoming obstacles or landslides		X			X				X			• Study the terrain before starting the work. • Identify passes and points of access without obstacles. • Do not allow passing through terrain that is prone to landslides.
Falls at different levels when overcoming obstacles, descending into ditches or wells or due to landslides		X		X					X			• Study the terrain and location before ascending anywhere • Bring adequate equipment for moving through piles, pits, wells and such, including ladders, ropes, lanterns, etc.
Burying, crushing or hitting with detached materials	X					X			X			• Do not allow passing through terrain that is prone to landslides • Wear the safety helmet • Locate places where it is safe to wait out.
Risks due to natural causes: winds, storms, fires, etc.		X				X				X		• Obtain timely weather forecasts for the work location. • Stay in constant contact with groups operating in uninhabited or remote locations • Bring navigation and communication equipment (detailed maps, GPS, cellphones, radios, etc.).
Attacks of wild animals		X			X				X			• Learn about potential presence of dangerous animals at the work locations and about risks of attacks. • Avoid attacks by wearing gloves, clothing, boots, or masks that prevent bites and stings. • Bring creams and antidotes, particularly treatments for allergic reactions.
WORK ON SITE												
	LIKELIHOOD			**CONSEQUENCES**			**RISK MAGNITUDE**					**PREVENTIVE MEASURES**
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Falls at the same level due to stumbling, overcoming obstacles or		X			X				X			• Study the terrain before starting the work. • Look for passes and point of access without obstacles.

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landslides											• Do not allow passing through terrain that is prone to landslides. Protect workers by installing nets, desks and such.
Falls at different levels when overcoming obstacles, descending into ditches or wells or due to landslides		x			x				x		• Mark the dangerous places. • Install ramps and ladders between different levels. • Cover wells and drains. • Provide safe escape exits and points of access for wells, pits, etc.
Bumps and cuts when placing stakes and rods	x			x				x			• Use tools with protection of hands • Put on protection gloves
Exposure to noise in work next to machinery		x			x				x		• Avoid when possible working near machinery. • Put on ear plugs and such.
Injury from shrapnel when driving stakes or as a result of the work of equipment nearby	x				x			x			• Wear protection goggles • Wear a safety helmet
Inhalation of dust		x		x				x			• Avoid working near dusty places and wear dust protection masks
Inhalation of gases	x				x				x		• Bring a gas detector or an oxygen leve tester for jobs where gas pollution or absence of oxygen is suspected. • In case of confirming presence of pollutants use gas masks or autonomous breezing equipment. Supply oxygen. • For jobs in wells develop procedures for working in cramped spaces.
Electric shock from contact with buried power lines	x					x			x		• Learn about possible presence of power lines and mark their locations and connections with high voltage hazard signs. • Wear dielectric gloves in case of possible contact with power lines and outlets.
Blows and crushing due to falling loose materials or landslides	x					x			x		• Study the work area in detail. • Protect from possible landslides with nets, boards, etc. • Identify passes and points of access without obstacles. • Do not allow passing through terrain that is prone to landslides. • Establish a work station in a safe place.
Accidents caused by the presence of construction vehicles			x			x				x	• Mark the areas for heavy machinery and do not allow access in those during the vehicles operation. • Workers must perform tasks in pairs when working near heavy machinery/vehicles. • Use marking ropes to mark the location.

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SITE CLEARING: EXCAVATION WORK													
	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Run over by machine or truck		X			X				X			• Do not stay within the radius of operation of heavy machinery.
Overturn of machine or truck		X			X				X			• Establish a horizontal work platform so that the excavator and trucks operate in a safe manner.
Contact with overhead or buried power lines	X					X			X			• Learn about exact locations of power lines. • Use devices to prevent contact of vehicles with aerial power lines.
Falling of objects during the work process		X				X				X		• Stay away from the radius of operation of machinery. • Use marking ropes.
Falls of people from the vehicles	X				X			X				• Use steps and handles to climb up and down the vehicles. • Keep the steps and handles clean and dry. • Never jump off and on vehicles.
Falls of people from the edge of the pit		X			X				X			• Mark with the warning tape the edge of the excavation. • Prevent approaching the river bank by placing a mound of soil as a safety barrier.
Hitting with or against some objects		X			X				X			• Climb up and down using the handles and steps of the machine, keeping them clean of mud. • Never jump off the machine, use the steps and handles to climb up and down.
Hazards from extreme weather conditions		X			X				X			• Have accurate weather forecast information to adjust timely to weather conditions
Vehicle collision		X				X				X		• Maintain a safe distance between the excavator and the construction vehicles.
Dustiness		X			X				X			• Keep the passageways watered to maintain adequate visibility.
Noise		X			X				X			• It is necessary to work with the doors and windows of the machine closed. • If this is not possible, it would be necessary to use hearing protection helmets.
TRANSPORT TO LANDFILL												

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	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Falls at different level		X			X				X			• Use the steps and handrails to get on and off the machine, keep them free of mud as well as footwear. • Never jump off the machinery, climb up and down using the steps.
Entry into an enclosed space		X			X				X			• It is prohibited to position the workers behind the construction trucks during maneuvers. • Use high visibility clothing.
Landslides		X			X				X			• It is forbidden to approach the construction truck near the edge of the excavation and necessary to avoid getting close to the river bank. • Place a ground safety barrier.
Contact with overhead or buried power lines	X					X			X			• Have precise information and signage regarding the presence of power lines. • Place height limiters to control the height of the construction vehicles before transiting through the area of the overhead power line.
Collisions with other vehicles		X				X				X		• Mark properly the traffic areas. • Respect the speed limits in the work zone.
Run over by machine or truck		X				X				X		• Approaching the truck at the edge of the excavation is prohibited, it is necessary to avoid getting close to the road used by the work vehicles. • Respect speed limits. • Keep the area free of dust by watering the area to improve visibility.
Overturn of machine or truck		X				X				X		• It is necessary to keep the work vehicle traffic areas clean and free of obstacles to prevent collisions and rollovers.

CONSTRUCTION OF A COFFERDAM

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	

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Run over by machine or truck		x				x				x	• Stay off the working radius of the construction machinery. • Use high-visibility clothing. • Restrict access of construction workers to the area and prohibit the transit of unauthorized personnel.
Overturn of machine or truck to the river		x				x				x	• Create a work platform with a perimeter made of a cobblestone. • Level up the work area to prevent possible overturns.
Contact with overhead or buried power lines		x				x				x	• Have precise information and signage for the presence of power lines. • Place height gauges to control the height of the construction vehicles before passing through the overhead power line area.
Landslide		x				x				x	• Fill the material with uniform layers starting from the edge, pushing it with the bulldozer while continuously compacting the material. • Prohibit the work trucks to approach the edge of the river platform to dump material. • Maintain communication between the work vehicles in the area to know the progress of the maneuvers approaching the edge of the platform. • Use the material bund at the edge of the platform to serve as a safety stop.
Falling of objects during the work process		x				x				x	• Keep workers out of the action radius of the machines. • Use high visibility clothing. • Restrict access of construction workers to the area and prohibit the transit of unauthorized personnel.
Falls of people from the vehicles		x				x				x	• Use the steps and handholds to get on and off the machine. • Never jump from the top, use the steps to get on and off
Falls of people from the edge of the excavation		x				x				x	• Barricade and protect the edge of the work area. • Restrict access of workers to the area and prohibit passage of unauthorized personnel.
Hitting with or against some objects		x				x				x	• Use the handholds and steps to climb up and down the machine. • Never jump from the top, use the steps to climb up and down.
Hazards from extreme weather conditions		x				x				x	• Have accurate weather forecast information to adjust timely to weather conditions.
Collisions with other vehicles		x				x				x	• Maintain a safe distance between the excavator and the work vehicles.

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											• Have the right number of construction machinery for the tasks in order not to have unnecessary vehicles in the work area.
Dustiness		x				x				x	• Keep the passage ways watered to maintain proper visibility.
Flood		x				x				x	• It is necessary to have information about the possible water releases from the regulation dams located in the upper part of the watershed.
Noise		x				x				x	• It is necessary to work with the doors and windows of the machine closed. • If this is not possible, use hearing protection helmets.

CONSTRUCTION WORKS											
DIGGING THE WELL FOR THE FOUNDATION											
	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Hits from the machine tools during approach maneuvers		x			x				x			• Do not remain within the operating radius of the piling rig. • If it is necessary to be in the area, remain within the operator's line of sight
Limb entrapment during shirting indoors		x			x				x			• Keep the working surface clean of excavation materials. • Stay out of the machine's working radius.
Hits due to swinging of suspended loads		x			x				x			• Park the machine safely, approach the parking spot at a safe speed and maintain a safe distance from the machines involved in the process.
Truck stuck (mud, uneven terrain)		x				x				x		• Keep the work area free of mud and elements that could cause problems of overturning or getting stuck for the construction vehicles.
Machine rollover (high speed, rough terrain)	x					x			x			• Before positioning the machine, prepare a smooth platform without elements that may endanger the balance of the drilling machine. • The drilling machine must be operated safely and without sudden maneuvers to avoid possible overturns.
Entrapment during cleaning and adjustment tasks		x			x				x			• Carry out the tasks safely and according to the work procedure.

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Dislodgement of the bit, broken cables or jaws	X					X			X			• Keep out the range of action of the machinery.
Trepan pendulum strikes	X				X			X				• Stay out of the working area of the machinery.
Falls at the same level		X			X				X			• Keep the work surface free of excavation materials and work tools.
Fall into the well		X				X				X		• Avoid working and walking on the edge of the well. • To prevent falls into the well, the shoring should protrude one meter above ground level.
Splashing of particles		X			X				X			• The workers should stay away from the drill when the drill operator cleans it by spinning.
Ambient noise		X			X				X			• Use ear protectors when necessary.
Hits by the machine		X				X				X		• Use the handles provided on the machine to get on and off, keep the steps free of mud.
Environmental dust		X			X				X			• Wear dust masks when the situation requires it and water the area when the surface is very dry and dusty.
Crushing by objects		X				X				X		• It is forbidden to stack cases at multiple heights to prevent them from rolling and trapping workers.

PLACEMENT OF REINFORCEMENTS IN THE WELL												
	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Unloading of armatures		X			X				X			• Do not remain within the working radius of the excavator. • If necessary, stay within the visibility zone of the machine operator.
Cuts and abrasions on the hands		X			X				X			• Keep the work surface clean of the excavation materials.
Entrapments		X			X				X			• Park the machine safely to ensure that it stays out of the way of other working vehicles
Hitting the upper limbs		X			X				X			• Movements of tied armatures are guided by an operator who will indicate to the machine operator the placement location. • The operator will remain outside the range of action of the machine and the armatures and will only communicate with the driver through gestures or via walkie-talkie.
Overturning of armature during its		X			X				X			• The maneuvers to handle and install the armature are to

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installation and manoeuvres.													be carried out keeping the personnel out of the machine's working radius.
Electrocutions from handling electrical machines		X				X				X			• Check electric elements and connections before starting work • Make sure there is proper grounding
Burns and fires from handling welding equipment		X				X				X			• Wear necessary protective equipment, including boots, leather gloves, fireproof clothes, leather chest protection and welding mask.
Contact dermatitis from working with steel		X				X				X			• Wear gloves during contacts with pieces of metal
Splashing of particles		X				X				X			• Protect face and eyes by wearing safety goggles or a welding mask
Radiation		X				X				X			• Wear necessary protective equipment, including boots, leather gloves, fireproof clothes, leather chest protection and welding mask.
Inhalation of vapors and gases		X				X				X			• Carry out welding tasks in open and well ventilated areas and wear protective equipment.
Gas explosions		X				X				X			• In cases of explosions and exposure to gases wear gas masks and use autonomous air supply. Keep gas volumes well maintained and properly stored

PILE CONCRETING

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Run over by machine or truck		X			X				X			• Do not remain within the operating radius of the piling rig. • If it is necessary to be in the area, remain within the operator's line of sight
Pinching of the upper and lower extremities		X			X				X			• Keep the work area free of construction debris.
Hits by objects		X			X				X			• Park the machine safely to ensure that it stays out of the way of other working vehicles
Burns from hot parts of the engine	X				X				X			• It is not allowed to grab the machine parts that become hot
Damage caused by dust in environment		X			X				X			• Wear dust masks when the situation requires it and water the area when the surface is very dry and dusty.
Noise produced by machines			X		X					X		• Use ear protectors

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Overwork, fatigue		x			x					x			• Use machinery for moving heavy loads. • Lifting heavy objects must be done by at least two people
Hitting with or against some objects		x			x					x			• The casings for concrete must be installed carefully • Use ropes and never install those casings with hands.
Object projection during work		x				x					x		• Stay away from the working radius of the machinery and use safety goggles.
Falls of people from the vehicles		x			x					x			• Use steps and grab onto handles for climbing up and down the machinery, keep the steps and handles clean.
Hitting with or against some objects		x			x					x			• Use steps and grab onto handles for climbing up and down the machinery, keep the steps and handles clean.
Extreme weather conditions		x			x					x			• Have accurate weather forecast information to adjust timely to weather conditions.
Collisions with other vehicles		x				x					x		• Stay away of the machines and vehicles.
Damage caused by dust in environment		x			x					x			• Keep the passageways watered to maintain adequate visibility.
Flood		x			x					x			• Have accurate weather forecast information to avoid flooding of the work area
Noise		x			x					x			• It is necessary to work with the doors and windows of the machine closed. • If this is not possible, it would be necessary to use hearing protection plugs and helmets.

PILE HEAD TRIMMING

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Noise		x				x				x		• Wear noise protection during the noisy work.
Footsteps on objects		x			x				x			• Wear boots with toe protection and anti-perforation soles. • Keep the work area clean.
Vibrations		x			x				x			• Properly maintain pneumatic hammers • Wear gloves to reduce vibrations.
Splashing of fragments or particles		x			x				x			• Wear protective goggles while operating pneumatic hammers

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Hit by vehicle		x				x				x	• It is prohibited to approach moving vehicles and machines • Install barriers around the work areas
Falls at the same level		x			x				x		• Maintain the work area flat and clean • Prevent accumulation of mud
Impacts and crushing due to falling materials		x		x				x			• Wear boots with toe protection and anti-perforation soles. • Keep the work area clean. • Use radio control where possible
Electrocutions from handling electrical machines		x				x				x	• Make sure everything is properly grounded • All electric equipment must be regularly checked.
Burns and fires from handling welding equipment		x			x				x		• Wear necessary protective equipment, including boots, leather gloves, fireproof clothes, leather chest protection and welding mask.
Contact dermatitis	x				x				x		• Wear gloves during contacts with pieces of metal
Splashing of particles		x			x					x	• Protect face and eyes by wearing safety goggles or a welding mask
Radiation		x				x				x	• Wear necessary protective equipment, including boots, leather gloves, fireproof clothes, leather chest protection and welding mask.
Inhalation of vapors and gases	x				x				x		• Carry out welding tasks in open and well ventilated areas and wear protective equipment.
Gas explosions		x				x				x	• In cases of explosions and exposure to gases wear gas masks and use autonomous air supply. • Keep gas volumes well maintained and properly stored

PLACEMENT OF THE HEADBOARD ON THE PILE

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Footsteps on objects		x			x				x			• Wear boots with toe protection and anti-perforation soles. • Keep the work area clean.
Hit by vehicle		x				x				x		• Stay clear of the trucks passage • Wear high visibility clothes

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Falls at the same level		x			x				x		• Maintain the work area flat and clean • Prevent accumulation of mud
Falls at the different level		x			x				x		• Use suitable ladders in the work area • Keep the area clean • Install ramps
Contact dermatitis of bare hands		x			x				x		• Wear gloves during contacts with pieces of metal
Electrocutions from handling electrical machines		x			x				x		• Make sure everything is properly grounded • Check electric elements and connections before starting the work.
Parts of the body are clamped by the mechanisms		x			x				x		• Keep the area clean of debris
Forced postures		x			x				x		• Adopt most erect postures during the work. • Change position to avoid excess tension.
Lifting heavy metal pieces		x			x				x		• At least two people should be involved in lifting heavy objects, keep the back straight. • A single person must not lift objects that weigh more than 25 kg • Lift things according to their size and weight, try to put more weight on knees and on your back • Spread the legs in order to distribute the weight of the load. • If it is necessary to lift object to a significant height from the ground, make sure there are some kinds of support halfway during the lift.
Falls and entrapments in the extremities while walking on the rebar		x			x				x		• Put wooden boards on ways and passages to prevent falling on metal structures
Crushing due to cable breakage		x				x				x	• The workers should stay clear of the area during moving of heavy objects • Avoid moving an object right above workers.
Footsteps on objects		x			x				x		• Wear boots with toe protection and anti-perforation soles. • Keep the work area clean.
Overturning crane		x				x				x	• Keep the area flat and clean of debris • Make sure that the crane is installed properly on firm ground • Workers must stay clear of the operating crane
Run over by machine or crane		x				x				x	• It is prohibited to approach the operating crane • Mark the work area

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Falling objects due to collapse		X				X				X	• Do not carry loads above workers
Fall of objects by manipulation		X				X				X	• Do not carry loads above workers, except when it is directly related to the conducted operation.
Strikes by objects and tools		X			X				X		• Pile construction pieces close to the installation area. • Piling must be done in a safe manner under the guidance of the head of the equipment operations.
Parts of the body are clamped by the mechanisms		X			X				X		• Keep the work area clean. • The operations must be implemented by teams experienced in manipulation and installation of iron structures.
Overwork, fatigue		X				X				X	• The unloading work must be implemented by teams of two people and a foreman, who will decide when to put the unloaded equipment.

FORMWORK OF THE FOOTING

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Contact with caustic or corrosive substances		X			X				X			• Wear appropriate protective clothing, gloves, and safety goggles to avoid contact with skin.
Footsteps on objects		X			X				X			• Wear boots with toe protection and anti-perforation soles. • Keep the work area clean.
Splashing of fragments or particles		X			X				X			• Use protection goggles.
Hit by machine or truck		X				X				X		• It is forbidden to approach the concrete mixer truck on the edge of the trench. • Place safety stops on the edge of the trench.
Falls at the same level		X			X				X			• Keep the work area clean. • Remove piles of mud that remain after excavation.
Falls from different levels		X				X				X		• Mark the dangerous places. • Install ramps and ladders between different levels.
Struck-by or caught-between incidents while placing metal props		X				X				X		• Use proper tools and protection gloves. • Keep away from metal pieces manipulated by machinery.

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Struck-by or crushing incidents from falling loose materials, displacement, or ground sliding		X			X				X		• Stack equipment and construction materials away from the slope and ensure that all stacks are safe and stable. • Always wear helmets at all times.
Peri-formwork overturn		X				X				X	• Install the casing parts according to provided manuals. • Avoid construction during days with strong winds.
Crane overturn		X			X				X		• It is prohibited to approach the truck near the edge of the excavation. • Safety stops will be placed at the edge and placed in a stable location.
Crushing from cable breakage		X				X				X	• Workers must keep away from objects that are being moved in the work area.

POURING OF THE FOUNDATION PAD

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Contact with caustic or corrosive substances		X		X				X				• Wear appropriate protective clothing, gloves, and safety goggles to avoid contact with skin.
Stepping on objects		X			X				X			• Wear boots with toe protection and anti-perforation soles. • Keep the work area clean.
Splashing of fragments or particles		X			X				X			• Use protection goggles.
Run over by machinery or truck		X				X				X		• It is prohibited to approach the concrete mixer. • Mark the restricted areas.
Failure of the formwork		X			X				X			• Use appropriate braces and struts to ensure the stability of the installation.
Falls at the same level		X			X				X			• Keep the work area clean. • Remove piles of mud that remain after excavation.
Falls from different levels		X			X				X			• Mark the dangerous places. • Install ramps and ladders between different levels.

EXECUTION OF THE LOAD-BEARING BEAM

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	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Run over by machine or truck		X			X				X			• Do not stay within the operating radius of the construction machinery. • Prohibited to stay behind the construction machinery. • Mark the work area, differentiating pedestrian access and, above all, limiting access for unauthorized personnel to the construction site.
Overturning of machine or truck		X				X				X		• Create a flat work platform to ensure safe operation. • Respect the permitted speed limits. • Place a soil embankment around the work area as a safety barrier for the work zone.
Contact with overhead or buried power lines		X				X				X		• Have accurate information and signage for the presence of power lines. • Place warning signs near the presence of power lines
Entrapment by landslide		X				X				X		• The excavated material will either be taken to a landfill or deposited away from the excavation area.
Projection of objects during work		X				X				X		• Keep workers out of the operating range of machines. • They should always wear high-visibility clothing and never stay in the rear area of the machines.
Falls of people from the vehicles	X				X			X				• Use the steps and handrails to climb up and down the machine, keeping the steps and footwear free from mud.
Falls of persons from the edge of the excavation		X			X				X			• Mark and protect the edge of the excavation with guardrails.
Hitting with or against some objects		X			X				X			• Use the handrails and steps of the machine to climb up and down, keeping the steps free from mud.
Collisions with other vehicles		X				X				X		• Maintain a safe distance between the excavator and the construction vehicles. • In case of working in situations with poor visibility (night work), enhance the lighting
Derived from dusty environments		X			X				X			• Keep the access roads watered to maintain proper visibility of the machines.
Noise		X			X				X			• It is necessary to work with the doors and windows of the machine closed. • If this is not possible, it would be necessary to use hearing protection helmets.

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APPLICATION OF CLEANING CONCRETE												
	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Contact with caustic or corrosive substances		X			X				X			• Use appropriate clothing and footwear, always wearing gloves and protective goggles to prevent potential contact with body parts.
Stepping on objects		X			X				X			• Use boots with puncture-resistant insoles and maintain a clean and orderly work environment. • Keep the work area free of iron trimmings or debris.
Splashing the fragments or particles		X			X				X			• Wear protective goggles during the pouring and vibrating of concrete.
Run over by machine or truck		X				X				X		• It is prohibited to approach the concrete mixer truck near the edge of the slope. • Safety barriers must be placed at the top of the slope, as well as signage using mesh.
failure of the formwork		X			X				X			• Use proper formwork and bracing, ensuring they are securely fastened before pouring concrete.
Falls at the same level		X			X				X			• Maintain a good level of cleanliness and organization in the work area. • Remove excavation debris and construction materials. • Store materials in designated areas separate from traffic zones.
Falls from different levels		X			X				X			• Use appropriate access points, ramps, and stairs to reach the work area safely.

FORMWORK FOR THE LOAD-BEARING BEAM												
	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Stepping on objects		X			X				X			• Use boots with puncture-resistant insoles and maintain a clean and orderly work environment.
Splashing the fragments or particles		X				X			X			• Wear protective goggles during the placement and joining of prefabricated metal pieces.

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Run over by machine or truck		x				x					x		• It is prohibited to approach the crane truck near the edge of the slope. • Place safety barriers at the edge of the slope.
Formwork failure		x				x				x			• Use appropriate formwork and bracing, ensuring they are securely fastened before pouring concrete.
Falls at the same level		x				x				x			• Maintain a good level of cleanliness and organization in the work environment.
Falls from different levels		x				x				x			• Use proper accesses, ramps, and stairs to ascend to the formwork.
Impacts and cuts during the placement of metal props		x				x				x			• Use appropriate tools, wearing protective gloves. • Keep a safe distance from the piece during handling, signaling the crane truck driver from an appropriate safety distance.
Hits and crushing from falling loose materials, movements or sliding of the ground		x				x				x			• Store and handle the metal formwork panels away from the edge of the slope, using appropriate sleepers to ensure stability of the storage. • Wear helmets during the task of placing and connecting the metal formwork panels.
Overturning of peri-type formwork		x					x				x		• Brace and shim the upstands correctly and according to the assembly instructions, avoiding assembly during strong winds. • Respect the assembly procedure at all times, especially in adverse weather conditions.
Overturning of the crane		x				x				x			• It is prohibited to approach the edge of the excavation near the truck. • Safety barriers will be placed at the edge and it will be positioned in a stable location.
Crushing due to cable breakage		x					x				x		• Workers should stay away from the pieces during the transfer operation to the final location, always avoiding being under materials being handled. • Use the cables and chains indicated in the assembly plan, using the connecting elements in perfect condition.

PLACING IRON IN THE BEAM LOAD-BEARER												
	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Stepping on objects		x			x				x			• Use boots with anti-puncture insoles and keep the work environment clean and tidy.

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Splashing the fragments or particles		x				x					x			• Use safety goggles during tasks involving cutting of metal bars.
Run over by machine or truck		x					x					x		• It is prohibited to approach the crane truck near the edge of the slope. • It is necessary to place safety barriers at the edge of the slope.
Falls at the same level		x				x					x			• Maintain a good state of order and cleanliness in the work area. • Remove excavation materials and iron debris. • Store construction materials in areas close to the work site, separate from the transit area.
Falls from different levels		x				x					x			• It is necessary to use appropriate accesses, ramps, and stairs.
Dermatitis from direct contact of bare hands with steel		x				x					x			• It is necessary to use protective gloves when performing tasks such as iron placement and tying.
Electrocutions from handling electric machines		x				x					x			• Use machines with proper connections and ensure they are grounded to eliminate electrical hazards. • Inspect electrical components and connections before starting work.
Entrapment by or between objects		x				x					x			• Maintain a clean and orderly work environment. Remove excavation materials and iron debris. • Store construction materials in areas near the work site, separate from the transit area.
Forced postures		x				x					x			• During the placement and tying of iron bars, it is necessary to adopt postures with the spine as straight as possible to prevent lower back pain. • Alternate working postures during tying tasks to reduce the risk of lower back pain.
Lifting heavy metal pieces		x				x					x			• Handle and manipulate heavy objects between two people, keeping the back straight. • Do not carry more than 25 kg or seek assistance from others if the weight is greater. Avoid adopting forced postures during lifting and use mechanical aids. • Properly grip the load according to its shape and size, and lift it by bending the knees, not the back. • Separate the feet to provide a stable and balanced posture for lifting, with one foot positioned slightly ahead of the other in the direction of movement. • Do not twist the torso or adopt forced postures; instead, rotate the entire body. • If lifting from the ground a significant height, support

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													• the load halfway to change the grip, first placing the load down and then readjusting if necessary. • Space out lifting tasks.
Falls and entrapment of limbs from walking on rebar		X				X					X		• It is necessary to place a wooden board walkway to prevent falls from the reinforcement to the ground or inside the iron framework.

POURING OF FOOTING AND GIRDERS

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Contact with caustic or corrosive substances		X			X				X			• Use appropriate clothing and footwear, always wear gloves and protective goggles to avoid potential contact with body parts.
Stepping on objects		X			X				X			• Use boots with puncture-resistant insoles and maintain a clean and orderly work environment.
Splashing the fragments or particles		X			X				X			• Use protective goggles during concrete pouring and vibration.
Run over by machine or truck		X			X				X			• It is prohibited to approach the concrete mixer truck near the edge of the slope. • It is necessary to place safety stops at the edge of the slope and mark the work area with signs.
Failure of the formwork		X			X				X			• Use appropriate knee pads and props, ensuring they are securely fastened before pouring the concrete.
Falls at the same level		X			X				X			• Maintain a good state of order and cleanliness in the work environment. • Use appropriate accesses, ramps, and stairs inside the formwork.
Falls from different levels		X			X				X			• It is necessary to use appropriate accesses and stairs to the concrete pouring area.

REMOVAL OF FORMWORK

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	

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Contact with caustic or corrosive substances		x			x					x			• Use appropriate clothing and footwear, always wear gloves and protective to prevent possible contact with body parts.
Stepping on objects		x				x					x		• Use boots with puncture-resistant insoles, maintain a good order and cleanliness in the work environment.
Run over by machine or truck		x					x					x	• Approaching the crane truck to the edge of the slope is prohibited. • It is necessary to place safety stops at the edge of the slope. • Mark the access area for construction vehicles, restricting their access the area where formwork is being removed.
Failure of the formwork		x				x					x		• Use appropriate knee pads and props, ensuring that they meet the safety conditions to be handled safely both during formwork and form removal.
Falls at the same level		x				x					x		• Maintain a good state of order and cleanliness in the work environment. • Store props and metal formwork boards in designated areas.
Falls from different levels		x					x					x	• It is necessary to use appropriate access points, ramps, and stairs for the work area.

PLACEMENT OF PREFABRICATED PIERS												
	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Crushing due to cable breakage		x				x				x		• Workers must stay away from the pieces during their transfer to the final location. • Prefabricated pieces should never be transported above workers.
Stepping on objects		x			x				x			• Use boots with puncture-resistant soles and keep the work environment clean and tidy.
Crane overturning		x			x				x			• Keep the work area free of material debris and properly compacted. • The crane must use support plates for any type of manipulation.
Run over by a machine or crane		x				x				x		• It is prohibited to approach the crane or any type of

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													construction machinery. • If necessary, mark the work area with barriers or signs. Create an earth mound around the perimeter of the peninsula.
Overturning of prefabricated piles		x				x					x		• Place the piles according to the assembly instructions, avoiding assembly during strong winds or adverse weather conditions. • Use props or bracing elements as per the assembly plan to ensure that the pile remains vertical.
Falls at the same level		x			x					x			• Keep the work area free of construction materials. Clean the work area from excavation debris and construction material remnants, ensuring that the crane has enough space maneuver safely.
Falls from different levels		x				x					x		• When climbing up or down the crane, use the handholds and steps while keeping them and your footwear free of mud.
Falling objects during folding and handling operations		x				x					x		• It is not allowed to transport loads above workers, and it is prohibited to walk or park underneath them. • The appropriate slings or chains for the type of prefabricated element being handled should be used.
Hits with objects and tools		x			x						x		• The piles will be stacked as close as possible to the assembly point, taking into account the need for work such as ladder handling and ensuring their proper stability. The team leader will verify their stability.
Getting stuck in or between objects		x			x					x			• Maintain the work environment in a good state of order and cleanliness. • Carry out operations and handling of prefabricated elements by a team formed and following the instructions of the assembly plan.
Overwork, fatigue		x			x					x			• The unloading maneuver will be carried out by crews composed of two workers and a foreman or team leader (in case the truck driver provides assistance, it will always be under the supervision of the team leader).

PLACEMENT OF PREFABRICATED BEAMS

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Falls from different levels		x				x				x		• It is necessary to keep the work environment level and

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													free of construction materials so that the crane can position itself safely, carrying out operations with full guarantees of success. • The lift platform must be positioned perpendicular to the lintel, taking into account that the transit area is flat and free of construction objects.
Falls at the same level		x			x				x				• In the case of concreting the lintel, the use of a lifeline is essential, which should be installed beforehand, before placing the prefabricated piece. • It is necessary keep the work environment free of construction materials so that the crane can position itself safely and carry out operations with full guarantees of success.
Run over by machine or truck		x				x					x		• Workers are prohibited from approaching the working radius of cranes and the elevated platform.
Stepping on objects		x			x				x				• Use boots with anti-puncture insoles and reinforced toe caps, maintain a good order and cleanliness in the work environment. • The proper condition of the reception area will be checked, verifying the presence of construction materials residue.
Crushing due to cable breakage		x			x				x				• Workers must stay away from the pieces during their transfer to the final location. • Appropriate slings or chains will be used according to the type of prefabricated element being handled.
Falling objects due to collapse		x				x					x		• It will be mandatory to carry out the lifting and subsequent transportation of lintels for their placement by correctly anchoring the tool provided by the installation company. • The team leader will verify the correct attachment of the shackle to the lifting hooks. • Inspection of the piece before lifting- Mark off the work area.
Falling objects due to handling		x				x					x		• The unloading maneuver will be carried out by crews composed of two workers and one team leader. • Proper leveling and compaction of the cofferdam before starting the lifting operations.
Falling objects due to detachment		x				x					x		• The transportation of lintels over workers is not allowed, and it is not permitted to circulate or park underneath them, except in necessary cases for the execution of work (fitting, alignment, etc.) and for the shortest

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													possible time.
Falling objects due to collapse		X				X					X		• Crane operation by specialized personnel. • Avoid the crane traveling along the edge of the cofferdam. • Construct an earth berm around the perimeter of the cofferdam to serve as a safety barrier.
Entrapment or crushing by or between objects	X					X			X				• Do not handle the cable at the moment of tensioning. Carry out the operations according to the assembly plan.
Entrapment and crushing due to overturning of machines or vehicles	X					X			X				• Verify the soil compaction status. • Avoid traveling near trenches, embankments, and the edge of the cofferdam.
Overexertion, improper postures.		X				X				X			• Use appropriate tools and equipment as described in the assembly plan provided by the manufacturer of the prefabricated pieces.

LEVELLING OF SELF-LEVELING CONCRETE PLATFORM

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Splashing the fragments or particles		X			X				X			• Wear protective glasses during the plateau layout operations.
Run over by machine or truck		X				X				X		• Mark the work area if necessary to prevent the convergence of construction machinery in the area. • It is necessary to place safety stops at the edge of the cofferdam.
Falls at the same level		X			X				X			• Maintain a good state of order and cleanliness on the lintel at all times, using a lifeline.
Falls from different level		X				X				X		• It is necessary to use aerial platforms to carry out these operations safely. • Park the aerial platform in a well-leveled and compacted area, positioning it perpendicular to the work zone.

CONCRETING OF THE LINTEL

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Contact with caustic or corrosive substances		X		X				X				• Use appropriate clothing and footwear, always wear gloves and protective goggles to avoid possible contact

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													with body parts.
Splashing the fragments or particles		X			X					X			• Wear protective goggles during the pouring and handling of concrete.
Stepping on objects		X			X					X			• Use boots with reinforced toe caps and puncture-resistant insoles, maintain a good order and cleanliness in the work environment.
Splashing the fragments or particles		X			X					X			• Use protective goggles during the pouring and vibrating of concrete.
Machine or lift platform collision		X				X					X		• Working within the range of action of the machines is prohibited.
Electrocutions	X				X			X					• Keep electrical connections in good condition for use. • Use grounding when performing the mixing operation with an electric concrete mixer.
Falls at the same level		X			X					X			• Maintain a good state of order and cleanliness in the work environment. • Keep the work area free from machinery or construction tools.
Falls from different level		X				X					X		• It is necessary to use work platforms with baskets. • In the concrete pouring process, the use of a lifeline is essential.

PLACEMENT OF NEOPRENE

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Falls from different level		X				X		X		X		• It is necessary to use safety elements such as a safety basket on an elevated platform or another element like a lifeline.
Falls at the same level		X			X				X			• It is necessary to use a lifeline when carrying out seat installation tasks.
Overturning of the elevating platform		X				X				X		• The work platform will be perfectly leveled and compacted to prevent failures or uneven terrain. • The operator will handle the platform by aligning the drive axles parallel to the lintel, thus avoiding machine overturns.
Falling of detached objects		X				X				X		• It is necessary to properly secure the neoprene to the crane to prevent potential load falls.
Striking and cutting by objects and tools		X			X				X			• The weather conditions will be taken into account at the time of execution.

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													• It is necessary to follow the assembly plan.
Entrapment by or between objects		X				X					X		• Do not remain under the load of the neoprene, indicating to the crane operator to transport it to the final location.
Crushing due to cable breakage		X					X					X	• Stay outside the range of the neoprene seat manipulation. • Use appropriate cables or slings to transport the seat safely.
Cuts on the hands		X				X					X		• Use safety gloves during the handling of slings and other materials.
Overwork, fatigue		X				X					X		• Never manually handle the seat; it is necessary to indicate the final location to the crane operator. • Avoid manual handling of the load by using mechanical means for this task.

STARTING AND PLACING BEAMS

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Stepping on objects		X			X				X			• Use boots with reinforced toe caps and puncture-resistant insoles, maintain a good order and cleanliness in the work environment.
Overturning of the crane		X			X				X			• Maintain a stable and level working platform to prevent tipping.
Crushing by cable or beam breakage	X					X			X			• Avoid positioning yourself within the working radius of the mobile crane and the beam transport truck.
Runover by mobile crane or truck		X				X				X		• It is prohibited to approach the construction personnel near the crane and transport truck area.
Falls from different level		X				X				X		• The beam installers will give instructions to the crane operator from the area of the protected abutments using a lifeline or other protective element, usually relying on the use of an elevated platform.
Falling objects due to collapse		X				X				X		• Beams shall not be suspended over workers, and it is not allowed to pass through or stop underneath them, except in necessary cases for the execution of the work (alignment, plumb, etc.) and for the shortest possible time.
Falling objects due to handling		X				X				X		• Beams cannot be suspended over workers, and it is not allowed to pass through or stop underneath them, except in necessary cases for the execution of the work

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													(alignment, plumb, etc.) and for the shortest possible time.
Fall of loose objects		X				X					X		• Beams cannot be suspended over workers, and it is not allowed to pass through or stop underneath them, except in necessary cases for the execution of work (alignment, plumb, etc.) and for the shortest possible time.
Slips, trips and falls at the same level		X			X					X			• In the tasks of directing and placing the beam, the workers who are directing the maneuvers at the ends of the beams will have access to an elevating platform and a lifeline.
Overwork, fatigue	X				X					X			• It is not necessary to handle any heavy elements in these types of operations. • It is necessary to maintain proper posture to avoid strained positions when directing the placement of the beams, always having a lifeline available.

PLACEMENT OF LOST FORMWORK CONCRETE DECK SLABS

	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Stepping on objects		X			X				X			• Use reinforced toe safety boots and shoes with puncture-resistant soles, and maintain a clean and orderly work environment.
Run over by machine or truck		X				X				X		• It is prohibited to approach the crane at the edge of the cofferdam. • It is necessary to place safety stops at the edge of the cofferdam, or construct a mound of earth around its perimeter.
Crushing by cable or beam breakage		X				X				X		• Avoid positioning oneself within the operating radius of the mobile crane and the plates.
Hits and cuts from tools or materials		X			X				X			• Use protective gloves when tying the pieces and when placing them in their final location.
Overturning of the crane		X				X				X		• Loading or unloading maneuvers should always be guided by a specialist to prevent risks from incorrect maneuvers. • Ensure that the working platform is sufficiently compacted to withstand the pressure of hydraulic jacks. • Check the proper condition of the stabilizing jacks before activating the crane.

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Stepping on objects		x				x					x			• Use safety boots with reinforced toe and puncture-resistant insoles, and maintain a clean and orderly working environment.
Overturning of the crane		x				x						x		• Maintain a sturdy and adequately leveled working platform to prevent overturning accidents.
Crushing by cable or beam breakage	x						x				x			• Avoid positioning oneself within the operating radius of the mobile crane and prefabricated plates.
Run over by mobile crane or truck		x					x					x		• It is prohibited to approach the personnel of the construction site near the crane and truck areas.
Falls from different levels		x					x					x		• The precast slab installers will provide instructions to the crane operator from the last placed slab, protected by a lifeline or other safety equipment, typically utilizing an elevating platform.
Falling objects due to collapse		x					x					x		• It will not be allowed to suspend precast concrete slabs over workers, nor will it be permitted to circulate or stop under them, except in necessary cases for the execution of the work (alignment, leveling...) and for the shortest possible time.
Falling objects due to handling		x					x					x		• Precast slabs cannot be suspended over workers, and it is not permitted to circulate or stop under them, except in necessary cases for the execution of the work (alignment, leveling...) and for the shortest possible time.
Falling objects due to detachment		x					x					x		• Precast slabs cannot be suspended over workers, and it is not allowed to circulate or stop under them, except in necessary cases for the execution of the work (alignment, leveling...) and for the shortest possible time.
Slips, trips and falls at the same level		x				x					x			• During the tasks of indication and placement of the beam, the operators who are directing the maneuvers at the ends of the precast slabs will have an elevated platform and lifeline.
Overwork, fatigue		x				x					x			• In the case of exerting efforts during the tasks of placing the precast slabs, it is important to maintain a straight back, bend knees, and use appropriate tools for applying force. • Necessary instructions will be given to the crane operator to avoid any manual handling of loads.

PLACEMENT AND TYING OF THE REINFORCEMENT FOR THE BRIDGE DECK

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	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Stepping on objects		X			X				X			• It is important to wear boots with reinforced toe caps and puncture-resistant insoles and maintain a clean and orderly work environment. • Periodically clean and remove iron debris, avoiding the presence of pointed or sharp-edged rebar.
Falls at the same level		X			X				X			• Maintain a walkway using wooden boards to prevent this type of falls.
Falls from different level		X				X				X		• Protect the entire perimeter of the slab, as well as the area of the flanges, with perimeter guardrails.
Splashing the fragments or particles		X			X				X			• Use protective goggles during any cutting operations that may be carried out.
Run over by machine or truck		X				X				X		• It is prohibited to approach construction vehicles to the area near the workstation.
Falls at the same level		X			X				X			• Keep the work area with adequate access to prevent possible trips over the rebar. • Have ramps or walkways for access to the bridge slab.
Falls from different level		X				X				X		• It is necessary to use appropriate access points, ramps, and stairs.
Dermatitis from direct contact of bare hands with steel		X			X				X			• It is necessary to use protective gloves when handling iron.
Electrocutions from handling electrical machines		X			X				X			• Use machines with the appropriate connections and ensure they are grounded to eliminate tensions. • Check electrical components and connections before starting the work.
Entrapment by or between objects		X			X				X			• Keep the work environment in good order and cleanliness. • It is necessary to place a wooden boardwalk to prevent falls from the rebar to the ground.
Forced postures		X			X				X			• During the placement and tying of iron bars, it is necessary to adopt positions with the spine as straight as possible, trying to change positions.

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Lifting heavy metal pieces		x				x					x			• Handle and manipulate heavy pieces between two people, keeping the back straight. • Do not carry more than 25 kg or seek assistance from others if the weight is greater. Avoid adopting forced positions during lifting and use mechanical aids. • Properly grip the load according to its shape and size, and lift it by bending the knees, not the back. • Separate the feet to provide a stable and balanced posture for lifting, with one foot positioned slightly ahead of the other in the direction of movement. • Do not twist the torso or adopt forced positions; instead, rotate the entire body. • If lifting from the ground to a significant height, support the load halfway to change the grip, first placing the load down and then readjusting if necessary. • Space out the lifting tasks.
Falls and entrapment of limbs from walking on rebar		x				x					x			• It is necessary to place a wooden board walkway to prevent falls from the iron bars to the ground.

CONCRETING OF THE BRIDGE DECK												
	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Contact with caustic or corrosive substances.		x		x				x				• Use appropriate clothing and footwear, always wear gloves and protective goggles to avoid possible contact with body parts.
Stepping on objects		x			x				x			• Use boots with reinforced toe caps and puncture-resistant insoles, keep the work environment free of protruding or round iron objects.
Splashing the fragments or particles		x			x				x			• Wear protective goggles during concrete pouring and vibration.
Run over by machine or truck		x				x				x		• It is prohibited to approach the concrete mixer truck and the concrete pump at the edge of the cofferdam. It is necessary to place safety stops at the edge of the cofferdam or a mound of soil around its perimeter.
Falls at the same level		x			x				x			• Keep the surface to be concreted free of protruding iron objects, maintaining a pathway using wooden boards.
Falls from different level		x				x				x		• It is necessary to keep the stairs and boots clean from

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													concrete and mud to ensure safe access.
Hits from vibrating objects		x				x				x			• Handle the concrete pump boom between two people to avoid hitting different parts of the body.
Toppling due to proximity to slopes		x					x				x		• Park both the concrete mixer trucks and the concrete pump in well-settled areas within the platform and never close to the slope heads.
Projection of objects due to bursting of pipes		x					x				x		• Perform periodic checks of the condition of the pipeline, replacing parts as indicated in the machine's operating manual. • Check the interior wear of the pipes to determine the need to replace deteriorated sections.
Entrapments during maintenance work		x				x				x			• Maintenance work should be performed when the machine is stopped or with the moving parts deactivated.
Contact with electrical current	x					x			x				• Keep the hoses in good condition, using grounding to eliminate electrical leaks. • Check the electrical components and connections before starting work.
Hose damage		x					x				x		• If pumping over a long distance, test the conduits under safe pressure before supplying concrete. • Check and replace the connections, joints, and elbows every 1000 m3 of pumped concrete.
Falls from the machine		x				x				x			• During machine maneuvers, operators should not be on the machines. • Access ladders should be kept free of concrete and mud residues.
Entrapment of individuals between the hopper and the concrete mixer		x					x				x		• During the concrete pouring operation, no cleaning or manipulation of moving parts of the concrete mixer should be performed.
Overwork, fatigue		x				x				x			• Handle heavy objects among multiple operators, keeping the back straight and bending the knees to adopt proper postures.

PLACEMENT OF BARRIER

	LIKELIHOOD				CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP		SH	H	EH	IR	LR	MR	HR	ER	
Falls at the same level	x						x			x			• Keep the area free of construction debris. • Continuously clean up construction debris throughout

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												the maneuvering and vehicle/person access area to the slab. • The slab must be free of leftover construction materials.
Falls from different level		X				X				X		• Use elevated platforms with baskets to place prefabricated pieces on the slab. • During the placement of the pieces from the slab, it will be necessary to use a protection system such as a lifeline.
Entrapment by or between objects		X				X				X		• Workers are prohibited from moving around the vicinity of machinery (truck, mobile crane). • Use high-visibility clothing.
Hits and crushing due to falling loose materials			X		X					X		• The prefabricated pieces will be placed according to the manufacturer's assembly plan. • Weather conditions, such as strong winds, will be taken into account before starting the assembly and jointing of the pieces.
Landslides		X			X				X			• It is prohibited to approach both the truck and the mobile crane near the edge of the slab where they are currently working.
Run over by machine or truck		X				X				X		• It is prohibited to approach construction vehicles to the workers during the unloading and placement of prefabricated pieces.

APPLICATION OF CLEANING CONCRETE TO THE TRANSITION SLAB												
	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Contact with caustic or corrosive substances		X		X				X				• Use appropriate clothing and footwear, always wear gloves and protective goggles to avoid possible contact with body parts.
Stepping on objects		X			X				X			• Use boots with reinforced toe caps and puncture-resistant insoles, maintain a good order and cleanliness in the work environment.
Splashing the fragments or particles		X			X				X			• Wear protective goggles during concrete pouring and vibration.
Run over by machine or truck		X				X				X		• It is prohibited to approach the concrete mixer truck at the edge of the slab. • It is necessary to place safety stops at the edge of the trench.

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Falls at the same level		X				X					X			• Maintain a good state of order and cleanliness. • Remove leftover construction materials such as wood scraps, packaging, etc.
Falls from different levels		X					X					X		• It is necessary to use appropriate accesses, ramps, and stairs while keeping the area of the edges perimeter protected.

PLACING OF REINFORCEMENT IN THE TRANSITION SLAB												
	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Falls at the same level	X					X			X			• Keep the area clean of construction debris
Falls from different levels		X			X				X			• Maintain the perimeter of the trench with appropriate guardrails to prevent potential falls from heights. • Use proper ramps and access points
Entrapment by or between objects		X			X				X			• Workers are prohibited from moving around the vicinity of machinery (truck, mobile crane). • Use high-visibility clothing
Struck or crushed by falling loose materials			X		X					X		• Handle metal bars between two people to prevent impacts and cuts.
Landslides		X			X				X			• Approaching both the truck and the mobile crane to the edge of the slope is prohibited
Run over by machine or truck		X				X				X		• Approaching the truck and mobile crane to the edge of the slope is prohibited. • Placement of safety barriers at the edge of the slope.

POURING OF CONCRETE FOR THE TRANSITION SLAB												
	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Contact with caustic or corrosive substances.		X			X				X			• Use appropriate clothing and footwear, always wearing gloves and protective glasses to avoid possible contact with body parts.

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Stepping on objects.		X			X					X			• Use boots with reinforced toe and anti-perforation insole, keep the work environment clean and organized.
Splashing the fragments or particles		X			X					X			• Use protective glasses during pouring and vibration of concrete.
Run over by machine or truck		X			X					X			• Do not approach the concrete mixer truck to the edge of the slab. • Safety stops must be placed at the edge of the slope head
Falls at the same level		X			X					X			• Maintain a good state of order and cleanliness.
Falls at different levels		X			X					X			• In order to maintain safety, it is important to use the proper access points and stairs, and to make sure that the area around these access points is protected or cordoned off in some way to prevent accidents

MAINTENANCE AND OPERATION												
	LIKELIHOOD			CONSEQUENCES			RISK MAGNITUDE					PREVENTIVE MEASURES
	LP	MP	HP	SH	H	EH	IR	LR	MR	HR	ER	
Falls from height	X					X			X			• Minimize being at height • Use special safety belts and other necessary equipment • Work with a partner
Inhalation of gases	X				X			X				• Use PPE (respirators and glasses) if necessary
Working over water		X				X				X		• Always have rescue equipment nearby • Work with a partner
Weather conditions	X				X			X				• Obtain timely weather forecasts for the work location. • Stay in constant contact with groups operating in uninhabited or remote locations • Bring navigation and communication equipment (detailed maps, GPS, cellphones, radios, etc.).
Noise		X		X				X				• If this is not possible, use hearing protection helmets

GENERAL RISKS												
RISKS OF WORKING OUTDOORS												
Work in the field												
Risks from natural causes: winds, storms, fires, etc.	X					X			X			• Get informed about the weather conditions in the work area.

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												• Maintain continuous communication during travels to uninhabited or hard-to-reach areas, or in anticipation of a storm. • Carry location and communication devices (detailed maps, GPS, mobile phone, radio, etc.).
Attacks of wild animals		x		x			x					• Knowing the presence of dangerous animals in the area and the risks of their attack. • Avoid possible attacks as much as possible and wear gloves, clothing, footwear, or masks that prevent possible bites or stings. • Carry protective creams and more common or specific antitoxins (if known), especially if allergic to any of them.
Exposure to noise when working near machinery.		x		x				x				• Avoid working close to machinery. • Wear earplugs or other equivalent protection when working in those situations.
Projectile fragments during stake driving or caused by machinery work nearby.	x				x			x				• During driving stakes into hard or rocky terrain, wear eye protection. • Use a safety helmet.
Inhalation of dust		x		x				x				• Avoid working in dusty environments. • Wear mechanical filter masks for those occasions.
Inhalation of gases	x					x			x			• Carry a gas detector or oxygen meter in jobs where the presence of contaminants or the absence of oxygen is suspected. • If the presence of contaminants is confirmed, identify them using colorimetric tubes and use masks with specific filters or use self-contained breathing apparatus. • In case of lack of oxygen, introduce it forcibly. In jobs in wells, develop and follow procedures for working in confined spaces.

Working in adverse weather conditions												
Derived from heat: Sunstroke and sunburn		x		x				x				• Perform prior acclimatization and wear clothes made of cotton or fabrics that allow perspiration and evacuate sweat, keeping the body dry. • Protect the head and the most sensitive parts of the body
Skin cancer	x				x			x				

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Dehydration Heat stroke			x			x						x		from direct sunlight. • Establish periods of rest in shaded and ventilated areas. • Avoid exposure as much as possible during the central hours of the day. • Apply appropriate protective creams according to the characteristics of our skin.
Derivatives of cold: Cold, pneumonia.		x			x					x				• Continuously hydrate with drinks that contain salts and • Wear warm underwear that allows transpiration (natural fabrics such as cotton and wool) and warm, waterproof outerwear that insulates and protects from low temperatures, humidity, and prevents heat loss. • Protect the head, hands, and feet to prevent heat loss from contact with the cold exterior. • Ingest calorie-rich foods and hydrate continuously with hot drinks. • Take frequent breaks in warm places that allow heat recovery. • Avoid cold drafts and humid places, moving away or shielding equipment that may cause cold or drafts.
Muscle and rheumatic pains.		x				x					x			
Hypothermia. Symptoms of frostbite.	x					x				x				
Heat or cold stress due to sudden temperature changes.	x					x				x				• Always avoid very sudden changes in temperature, by carrying out prior acclimatization before starting any work. • Adjust your work pace to the ambient temperature, decreasing it when it is very hot and increasing it when it is very cold. • Always have clothing at hand to be able to react to a sudden change in temperature.
Lightning strike from an electric storm	x						x				x			• Avoid working in the presence of electrical storms or immediately stop work if they appear. • In case of being caught in an electrical storm, seek shelter and avoid trees, posts, metallic objects, or contact with water or damp places.

Individual work

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Overconfidence in professional skills and worth			x		x					x		• Not to be overconfident in any work and always keep in mind and apply the corresponding safety standards for each type and place of work. • Respect safety standards when using machinery and tools. • Use personal protective equipment correctly and pay attention to and respect safety signage.
Overconfidence in mastering natural risks.			x			x					x	• To prevent overconfidence in natural hazards, it's important to survey the terrain before beginning any work and always proceed with caution and careful consideration for work that is heavily dependent on nature, climate, and terrain. • It's important to have up-to-date information about the risks of the location and work environment and to take them into account when performing the required task.
Teamwork												
Lack of coordination during work.		x			x					x		• All workers must have a good understanding of the job to be performed and the tasks that correspond to each person at all times and within the team. • For delicate work or work that requires coordination, it is necessary to establish a code of verbal communication, gestures, or signals that is simple and clear and that everyone knows and can interpret.
Inadequate communication with the assistant.		x		x				x				• Provide an effective means of communication for each work situation or provide intercoms if necessary
Inappropriate language or attitudes	x			x			x					• Avoid using language or behaviors that may endanger good understanding among workers, use moderate language, and correct behaviors if necessary. • Avoid violent attitudes and behaviors towards co-workers.

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The main hazards that workers may encounter during the implementation of the project include:

- Falls from different levels
- Works near water object
- Struck by various loads or machinery
- Risks when working with construction equipment
- Risk of road traffic accidents
- Skin and mucous membrane exposure to fragments/sparks
- Inhalation of dust and vapors/gases
- Electrical injuries
- Noise exposure
- Fires and explosions
- Ergonomics/fatigue
- Risks associated with the impact of environmental conditions
- Risks caused by insufficient communication in teamwork.

To mitigate these hazards, it is essential to implement comprehensive safety measures, provide adequate training and protective equipment, conduct regular risk assessments, and promote a strong safety culture on the construction site. Workers should be made aware of potential risks and follow proper safety protocols to ensure a safe working environment.

1 HEALTH AND SAFETY POLICY

Organizations have a legal responsibility to prioritize workplace safety and uphold health standards. To achieve this, comprehensive safety policies must be established, designating responsible individuals authorized to delegate responsibilities at all levels. By conducting thorough risk assessments and addressing hazards, accidents can be prevented.

This section outlines key principles and procedures to ensure workplace safety and promote a culture of safety among employees.

A Contractor must have an established occupational health and safety policy that includes the following principles:

- Independently identify and assess risks for each specific type of work on the construction site at each stage of construction.
- Develop measures to eliminate or mitigate risks to ensure the safety of workers.
- Maintain cleanliness and order on the construction site and in the construction camp.
- Develop a specialized safety training program for workers.
- Conduct introductory and periodic trainings and assess the workers' level of knowledge.
- Provide personal protective equipment (PPE) to workers and train them in its proper use.
- Create an effective team and clearly define job responsibilities, including responsibilities for occupational health and safety.
- Establish a safe and healthy infrastructure for workers.
- Ensure personnel security while on the work site.
- Implement disciplinary measures and accountability to prevent violations.
- Train workers to respond to emergency situations.
- Foster a collective commitment to workplace safety among all employees and encourage it.

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- Provide regular medical check-ups, measures to prevent infectious diseases, and vaccinations for workers.

4.1. Occupational Safety Precautions

Procedures and safe work guidelines are essential for effective risk management in the road and bridge construction projects. The contractor is expected to develop a set of **health and safety procedures and rules** that address the potential risks identified. These policies and procedures may include, but are not limited to:

- Personnel Training and Competency
- Emergency Response and Incident Management Plan
- Construction Site Security Procedure
- Sanitary and Hygienic Safety Procedure
- Construction Site Safety and Protection Regulations
- Personal Protective Equipment (PPE) Usage and Functions Handbook
- Excavation Rules
- Scaffolding Construction and Handling Rules
- Working at Heights Safety Guidelines: Preventing Falls from Height
- Procedures for Preventing Falling Object Injuries
- Welding Work Rules
- Working On, Over, In or Near Water Procedure
- Hand Tools Usage Rules
- Handling Hazardous Substances Rules
- Electrical Work Rules
- Explosive Work Safety Plan (Techniques and Procedures)
- Construction Site Vehicle and Equipment Safety Rules and Measures
- Communication Plan at The Construction Site
- Traffic Management Plan (TMP)

In this section, we present a comprehensive overview of the general recommendations and procedures aimed at minimizing risks. Contractors and subcontractors are expected to develop and approve specific instructions based on these outlined recommendations. It is the contractor's responsibility to effectively communicate these policies and procedures to all construction site workers, ensuring regular reviews and updates to accommodate any changes in the risks or hazards identified.

Construction Site Safety Procedure

4.1.1.1. Site Rules

Site rules refer to a set of policies and procedures that must be followed on a construction site to ensure the safety of workers, the public, and the environment. The site rules will cover a range of areas, including health and safety, security, environmental protection, and other issues that are relevant to the construction project. The site rules will be communicated to all workers, visitors, and contractors who enter the site.

The site rules overview provides a summary of the key site rules that must be followed on the construction site. The overview will be prominently displayed at the entrance to the site and

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will also be communicated to all workers, visitors, and contractors. The overview will cover the following areas:

- **Personal protective equipment.** All workers on the construction site must wear appropriate PPE. This will include hard hats, safety boots, hi-vis clothing, gloves, and other equipment as required.
- **Access and egress.** Access to the construction site will be controlled to ensure that only authorized personnel can enter the site. All workers and visitors must sign in and out of the site. A designated entrance and exit will be used, and a traffic management plan will be in place to ensure the safe movement of vehicles and pedestrians.
- **Hazardous materials.** All hazardous materials used on the site will be stored and handled in accordance with the manufacturer's instructions and relevant legislation. Workers will receive training on the safe handling and disposal of hazardous materials.
- **Environmental protection.** The construction site will be managed to minimize its impact on the environment. This will include the use of environmentally friendly materials and practices, and the safe disposal of waste.
- **Emergency procedures.** The site will have an emergency plan in place, which will be communicated to all workers, visitors, and contractors. Workers will be trained in emergency procedures, including the evacuation of the site.
- **Prohibited activities.** The construction site must be designated as an alcohol-free zone. The storage and consumption of alcohol at the construction site should be strictly prohibited. Additionally, the site rules should also include a policy regarding other prohibited substances, such as drugs or other controlled substances, and their consequences. Furthermore, tobacco use should be limited to designated areas to prevent secondhand smoke exposure for non-smoking workers. These rules must be communicated to all workers and strictly enforced to ensure compliance.

By implementing and enforcing the site rules, the construction project can be completed safely and efficiently, with minimal risk to workers, the public, and the environment.

4.1.1.2. Site Amenities

Site amenities are the facilities and resources provided for workers to promote their health, safety, and well-being while on the job. Proper site amenities can help ensure a productive and efficient workforce, reduce fatigue and stress, and enhance job satisfaction. The contractor must provide amenities for workers at the construction site. Their location and quantity will depend on the number of workers involved in specific types of work.

Some examples of site amenities that should be placed at the construction area are below:

Clean Drinking Water: Clean drinking water should be provided on site to ensure that workers stay hydrated throughout the day. Access to water stations and drinking fountains should be located at convenient locations around the site.

Toilet Facilities: Portable toilets or permanent toilet facilities should be provided to promote personal hygiene and prevent the spread of illness. The toilets should be maintained and cleaned regularly to ensure their functionality.

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Rest Areas: A designated rest area should be provided on site, which is separate from the work area. The rest area should be equipped with chairs or benches, tables, and shade or shelter to allow workers to take a break from the sun or other weather conditions.

First Aid: A first aid station or kit should be readily available on site in the event of an injury or medical emergency. This should be easily accessible and visible to all workers.

Washing and Cleaning Facilities: Hand washing and cleaning facilities should be provided on site to help prevent the spread of germs and disease. Access to soap, water, and paper towels should be made available.

Food and Beverage Facilities: On-site catering facilities or vending machines should be provided to allow workers to purchase food and beverages during their breaks.

By providing these site amenities, employers can promote the health and safety of their workers, which can lead to a more productive and efficient workforce.

4.1.1.3. Mobile Phone Use Policy

Mobile phone use on a construction site can present a safety hazard if not managed properly. Therefore, it is important to establish clear guidelines for mobile phone use to ensure the safety of all workers on the site.

There are some recommendations that could be implemented:

- Mobile phone use is prohibited in any areas where heavy equipment is being operated, or where workers are performing tasks that require their full attention.
- Workers may use their mobile phones during breaks or in designated areas where it is safe to do so.
- If a worker needs to use their mobile phone for an urgent matter, they must move to a safe area away from any potential hazards before doing so.
- Hands-free devices, such as earpieces or Bluetooth devices, must be used when making or receiving calls while driving any mobile plant or operating any hand-held power tools.
- Mobile phones should be kept on silent mode while on the construction site.
- If a worker is found to be using their mobile phone in an unsafe manner, they will be subject to disciplinary action.

By following these guidelines, the use of mobile phones on the construction site will be managed in a way that reduces the risk of accidents and injuries, and helps to maintain a safe working environment for all workers.

4.1.1.4. Site Security

Site security is an essential aspect of any construction project. The following measures will be implemented to ensure site security:

- A Security Plan will be developed and implemented to protect workers, equipment, and materials from theft, vandalism, and other security threats. The plan will outline the responsibilities of security personnel, as well as procedures for incident reporting and response.
- Access to the site will be strictly controlled and limited to authorized personnel only. This will be achieved through the use of fencing, gates, and signage, as well as security personnel at access points.
- Lighting will be installed around the site perimeter to improve visibility and deter criminal activity.

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- Security cameras will be installed at strategic locations to monitor activity on the site.
- Regular security patrols will be conducted to detect and prevent unauthorized access, theft, or vandalism.
- The project team will maintain a list of all equipment and materials on site to enable quick identification and reporting of any missing items.
- Security personnel will be trained in emergency response procedures, such as evacuation, first aid, and fire safety to ensure a prompt and effective response to any incidents that may occur.

4.1.1.5. Construction Site Safety Signs

Placement of special signs at construction site is an important aspect of OH&S, as it helps to communicate important information to workers and visitors on site. The following types of site signage will be used:

Hazard warning signs: These signs will be used to warn workers and visitors of specific hazards on site, such as high voltage electrical equipment, dangerous machinery, or hazardous materials. These signs will comply with local regulations and standards.

Prohibition signs: These signs will be used to indicate areas where access is restricted or prohibited, such as areas where excavation or demolition work is taking place. They will also indicate where smoking or eating is not permitted.

Mandatory signs: These signs will indicate that specific actions or behaviors are required, such as the use of PPE or following specific safety procedures.

Emergency signs: These signs will provide directions to emergency exits and equipment, such as fire extinguishers and first aid stations.

Directional signs: These signs will be used to provide directions to specific areas on site, such as restrooms, offices, or break rooms.

In addition to the above signs, the project team will ensure that all signage is clearly visible and legible, with appropriate language and symbols that are understood by all workers and visitors.

The location of signs will also be carefully considered, to ensure that they are placed in strategic locations where they are easily visible and accessible. Regular inspections will be conducted to ensure that all signs are in good condition and are still relevant to the work being carried out on site.

4.1.2. Personnel Training and Competency

Conducting initial and periodic specialized briefings/trainings for workers on environmental protection, health, and safety is one of the important measures at a construction site. Workers must be informed of potential safety and health hazards and instructed and trained in the prevention and control measures available to protect against those hazards.

All workers should be instructed and trained on general safety and health measures common to the construction site, including their rights and duties, access and egress during normal and emergency situations, good housekeeping practices in construction camps, location and proper use of welfare amenities and first-aid facilities, proper use and care of personal protective equipment, general measures for personal hygiene and health protection, fire precautions, emergency procedures, and relevant safety and health rules and regulations.

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Relevant safety and health rules, regulations, and procedures should be available to workers at the start of their employment and whenever changes occur.

National laws or regulations should prescribe the nature and length of training or retraining required for various categories of workers employed in construction projects, and employers should have the duty to establish appropriate training schemes or arrange to train or retrain various categories of workers.

No person should be employed in any work at a construction site without the necessary information, instruction, and training to do the work competently and safely.

The competent authority should collaborate with employers to promote training programs that enable all workers to understand safety and health matters.

Specialized instruction and training should also be provided to workers who operate lifting appliances, transport vehicles, earth-moving and materials-handling equipment and plant, machinery or equipment of a specialized or dangerous nature, as well as those involved in the erection or dismantling of scaffolds, excavations, blasting operations, pile-driving, compressed air work, cofferdams and caissons, prefabricated parts or steel structural frames, concrete work, formwork, hazardous substances handling, and signaling.

National laws and regulations may require drivers, operators, or attendants to hold a certificate of proficiency or license to operate certain vehicles, lifting appliances, boilers, or other equipment

Qualified experts should conduct proper trainings to ensure that all workers are adequately prepared to handle equipment and machinery.

Obtaining certificates as proof of completion of equipment operation training is essential.

Documentation confirming the completion of the briefing/training should be maintained.

The information, instruction, and training should be provided in a language understood by the worker, and written, oral, visual, and participative approaches should be used to ensure understanding.

The frequency of worker training implementation should consider the nature of the work, the complexity of the tasks, the level of risk, and the regulations and guidelines in place. Regular worker training is recommended, especially for high-risk tasks, changes in regulations or guidelines, or new equipment or processes. The frequency of training should also consider the workers' level of experience and competency.

Ultimately, a thorough assessment of job requirements, risks, and worker needs should determine the frequency of worker training implementation to ensure that workers are adequately trained and competent to perform their work safely and effectively.

4.1.3. Emergency Response and Incident Management Plan

Emergency preparedness is an integral and proactive process aimed at planning for and effectively responding to emergencies or disasters. It involves a thorough identification of potential risks and hazards, the development of comprehensive response plans, and the provision of proper training and resources to individuals and organizations to ensure their readiness to manage emergency situations.

Within the framework of a construction project, emergency preparedness constitutes an essential component of the project plan, characterized by well-defined procedures and protocols to handle emergencies. This includes maintaining readily accessible emergency contact information, conducting regular emergency drills, training workers on emergency procedures,

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and ensuring the availability of appropriate equipment and resources to address emergency situations.

Effective emergency preparedness also necessitates collaboration with local emergency responders to ensure seamless coordination and communication during emergencies. This may involve developing joint emergency response plans in conjunction with local police, fire, and medical services.

Accident Reporting and Incident Management

All employees are obligated to promptly report any accidents, injuries, illnesses, or near-miss incidents to their supervisors. Supervisors or management personnel will conduct necessary inquiries to accurately complete the company's accident report form. The form will subsequently undergo review by management, supervision, and the employee involved to determine preventive measures against similar incidents.

Emergency Communications and Action Plan

The contractor will develop ***Emergency Communications and Action Plan*** that will include the following steps in the case of an emergency:

- Cease all work activities.
- Notify all employees of the emergency and its location.
- Immediately evacuate the facility.
- Assemble at the designated assembly point, away from the building and emergency responding vehicles.
- Perform a head count to ensure all workers are accounted for.
- Use a company or personal cell phone to inform off-site management.
- Contact emergency service providers as needed:
    - Fire Department: Dial 01 (or 101 if using a cell phone)
    - Police Department: Dial 02 (or 102 if using a cell phone)
    - Medical Emergency: Dial 03 (or 103 if using a cell phone)

Furthermore, a Contractor will establish personal contacts with local responsible authorities for emergency response. This will help address arising issues more promptly. Below is a table listing the responsible individuals.

Sarband Jamoat		
Head of the fire department	Mirzo Juraev	989016201
Head of the first-aid post	Abdullo Lolaev	918701035
District police officer	Parviz Nabotov	937939474
Emergency Situations Department	Ziyoviddin Dzhonov	988983388
Safedchashma Jamoat		
1. Head of the first-aid post	Sobira Kholmatova	988703007
2. District police officer	Ahmad Iskandarzoda	985777402

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Prompt access to emergency services and pertinent telephone numbers during an emergency is vital. This information must be readily available and communicated clearly to all workers on the project site. Additionally, a well-defined plan for responding to emergencies, including evacuation procedures and measures for addressing potential hazards or risks, must be in place.

Regular drills and exercises should be conducted to familiarize workers with emergency procedures and ensure a swift and effective response to emergency situations, minimizing the risk of injury or property damage.

Hospitals also play a crucial role in emergency preparedness. Knowledge of nearby hospital locations, their capacities, and specialized services assists in responding to accidents, injuries, or illnesses that occur on the project site. Establishing communication and coordination protocols with local hospitals ensures that workers receive appropriate and timely medical care during emergencies.

Key steps in response to an incident include:

- Establishing an emergency response team with defined roles and responsibilities, encompassing representatives from areas such as first aid, fire safety, and emergency response.
- Developing an emergency response plan outlining procedures for handling incidents, including evacuation, first aid protocols, and contact information for emergency services.
- Providing comprehensive training to all workers on the emergency response plan, including the proper use of emergency equipment like fire extinguishers and knowledge of emergency exits.
- Conducting regular drills to ensure workers' familiarity with the emergency response plan and their ability to act effectively during incidents.
- Identifying and assessing hazards in the work environment that could potentially lead to an incident, followed by implementing measures to control or eliminate such hazards.
- Documenting all incidents that occur and conducting thorough investigations to determine root causes, enabling the identification of trends and the implementation of preventative measures.
- Implementing corrective actions to address identified hazards and prevent future incidents.
- Regularly reviewing and updating the emergency response plan to ensure its currency and effectiveness.
- Communicating the emergency response plan to all stakeholders, including workers, contractors, and the public.

By adhering to these practices, construction projects can fortify their emergency preparedness, enhance safety measures, and respond effectively to incidents, thereby safeguarding the well-being of their workforce and the overall project's success.

4.1.4. Sanitation and Hygiene

To ensure sanitation security at a construction site, the following measures can be taken:

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Provide adequate and appropriate toilets: Sufficient toilets should be provided based on the number of workers at the site. These toilets should be regularly cleaned and disinfected to prevent the spread of diseases.

Install handwashing stations: Handwashing stations with soap and water should be installed near the toilets and other areas where workers are likely to come into contact with contaminants.

Proper waste disposal: Proper waste disposal facilities should be set up to prevent the accumulation of waste and the spread of diseases. Hazardous waste should be properly stored and disposed of according to local regulations.

Regular cleaning and maintenance: The entire construction site should be regularly cleaned and maintained to prevent the buildup of dust and debris, which can pose health hazards.

Educate workers: Workers should be educated on proper sanitation practices, including the importance of handwashing and the use of toilets.

Provide personal protective equipment (PPE): Workers should be provided with appropriate PPE, such as gloves and masks, to protect them from exposure to contaminants or infections.

Conduct regular inspections: Regular inspections should be conducted to identify any sanitation hazards and ensure that all measures are being implemented effectively.

Overall, sanitation security is critical to maintaining a safe and healthy work environment at a construction site

4.1.5. Personal Protective Equipment

Personal Protective Equipment (PPE) is essential for ensuring the safety and health of workers at construction sites. It includes specialized equipment and clothing designed to protect workers from various hazards and risks that may arise during construction activities, such as falls from heights, exposure to hazardous substances, and electrical hazards.

All personnel within the work zone must wear PPE, which may include hard hats, steel-toed boots, vests, or jackets in neon or bright lime, yellow, or orange colors. This clothing makes workers more visible to drivers, minimizing the risk of collisions.

Employers must provide suitable PPE and protective clothing without cost to workers, as prescribed by national laws or regulations. These should comply with standards set by the competent authority, taking into account ergonomic principles.

A competent person should select suitable PPE and arrange for proper storage, maintenance, and cleaning. Workers should be instructed in the use of PPE and required to make proper use of and take good care of the equipment provided.

Necessary PPE includes safety helmets or hard hats, clear or colored goggles, protective gloves or gauntlets, appropriate footwear, respiratory protective equipment, safety harnesses, life vests, and distinguishing clothing or reflective devices.

Standard operation at the PIURR work sites will require Level D PPE. Below is an approximate list of the necessary equipment, which may vary depending on the specifics of the work:

- Hard Hats (ANSI Z89.1)
- Coveralls
- Steel-toed boots or composite-toed work boots at or above the ankle (ANSI Z41)
- High visibility safety vests Class II or Class III (ANSI/107-20101)
- Safety glasses (ANSI Z787.1)

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- Hearing protection (with Noise Reduction Rating (NRR) rating of 26 or higher) shall be worn as applicable to noise hazard conditions. (29CFR-1910.95)
- Face shield with safety glasses for trimmer or chainsaw operations
- Gloves: Leather for general use of as appropriate to exposed hazards

Modified Level D (Additional to Standard Level D PPE):

- Washable (rubber) steel-toed boots
- Nitrile (surgical-type) inner gloves with leather outer gloves (if in direct contact with contaminated materials)

PPE shall be regularly washed, repaired or replaced if worn or torn. Coveralls shall be worn at all times by excavation and backfill crews:

- Coveralls shall have full length sleeves and be worn in their entirety and all times.
- Coveralls shall not be worn into public places (i.e. grocery stores, restaurants, etc.)
- Contaminated coveralls shall not be taken home in personal vehicles.
- Coveralls will be removed prior to leaving the job site, placed in a bag and placed in the designated laundry receptacle. The coveralls will be picked up, cleaned and returned by subcontractor.

Hot work gauntlets are protective gloves designed to provide heat resistance and protection from flames, sparks, and other hot materials during welding, cutting, and other hot work activities. They are typically made of materials that can withstand high temperatures such as leather, Kevlar, or other fire-resistant fabrics. The gauntlets cover the wearer's hand and extend up to the forearm, providing protection for the wrist and lower arm as well. They may also include additional features such as reinforced palm and finger areas for added durability and grip. Hot work gauntlets are an essential piece of personal protective equipment for workers performing hot work tasks in a variety of types of work.

Asphalt workers using hand tools that are actively placing and working in and around the hot asphalt being placed on the ground for paving purposes are exempt from wearing hard hats. This exemption is to prevent injuries that may occur due to the hard hats falling off. By the hard hat falling off, the worker could try to reach out and catch the hard hat causing them to lose balance and an injury may result by them coming into contact with the hot surfaces.

This exemption will not apply to workers on the machinery being used in the paving process.

Asphalt, sod and punch-list workers, who are working on clean uncontaminated surfaces, will be exempt from wearing the required coveralls. This will allow the workers to perform their task in an unrestricted fashion, free from bulky clothing that could hamper their abilities during their task. This will also minimize the possibility of heat related injuries when working in a clean area.

This exemption does not apply to workers who are performing tasks in and around contaminated areas. The wearing of coveralls is an added layer of protections and due care is required when working in coveralls. If the coveralls are too bulky and are causing a hazard, an alternative means of performing the task should be evaluated. If heat is an issue, more breaks and hydration should be addressed.

All required PPE will be utilized during all operations with the exception of the exemption listed above.

All employees and subcontractors will decontaminate their work boots prior to leaving the job site by brushing and/or hosing off the boots.

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4.1.6. Excavation Works

To ensure safety at the construction site, the contractor is responsible for creating and approving excavation rules, which must be communicated to all workers. These rules should cover potential risks and the measures to be taken to prevent them. Mitigation measures for the excavation works are listed below but not limited to:

- Risk assessment shall be done during the planning of excavation works.
- Work permit shall be obtained to establish excavation works.
- Excavation works shall be performed under supervision.
- Excavation equipment shall be checked before use.
- Excavation team shall have training on Excavation Risks.
- Excess excavated material shall be disposed of at least 1 meter away from the excavation area.
- Depending on the condition of the excavated soil, it shall be strengthened by excavation or lining or by 45 degrees angling, after the opinion of HSE Manager.
- If there is a live line (electricity, gas, steam, etc.) in the excavation area, energy shall be cut off or if it is not required to cut it off, the precautions that should be taken shall be specified by Work Permit.
- If vibration will likely cause subsidence, special precautions shall be taken.
- Working in the excavated area subjects to Confined Spaces Work Permit.
- For excavations deeper than 5 m, vehicle operation around the excavation area shall be prohibited. At least two locations shall be determined to go down, if it is necessary and the slope of the excavated area shall be checked by supervisor before going down.
- The excavation area shall be surrounded by barriers and warning lights shall be located for the night.
- Manual excavation shall not be preferred if it is not compulsory due to technical reasons. Excavations deeper than 50 cm shall not be performed manually.
- Special training shall be conducted for workers who will perform manual excavation.

All excavation work should be supervised by a competent person and operatives doing the work should be given clear instructions.

Sides of excavations should be thoroughly inspected:

- daily, prior to each shift and after interruption in work of more than one day;
- after every blasting operation;
- after an unexpected fall of ground;
- after substantial damage to supports;
- after a heavy rain, frost or snow;
- when boulder formations are encountered.

No load, plant or equipment should be placed or moved near the edge of any excavation where it is likely to cause its collapse and thereby endanger any person unless precautions such as the provision of shoring or piling are taken to prevent the sides from collapsing.

Adequately anchored stop blocks and barriers should be provided to prevent vehicles being driven into the excavation. Heavy vehicles should not be allowed near the excavation unless the support work has been specially designed to permit it.

If an excavation is likely to affect the security of a structure on which persons are working, precautions should be taken to protect the structure from collapse.

Sides of excavations where workers are exposed to danger from moving ground should be made safe by sloping, shoring, portable shields or other effective means.

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All support work should be regularly checked to ensure that the props, wedges, etc., are tight and no undue deflection or distortion is taking place.

All timber subject to the varying weather conditions should be regularly checked for dryness, shrinkage and rot.

4.1.7. Working on Scaffolds and Ladders

When work cannot be safely performed on or from the ground, a safe and suitable scaffold or other equally safe provision should be provided and maintained. All scaffolds and ladders should be constructed, erected, and used in accordance with national laws and regulations.

Scaffolds

- Where work cannot safely be done on or from the ground or from part of a building or other permanent structure, a safe and suitable scaffold should be provided and maintained or other equally safe and suitable provision should be made.
- Scaffolds should be provided with safe means of access, such as stairs, ladders or ramps. Ladders should be secured against inadvertent movement.
- All scaffolds and ladders should be constructed, erected and used in accordance with national laws and regulations.
- Sufficient suitable and sound material should be provided and used in the construction of scaffolds.
- Timber used in the construction of scaffolds should be straight-grained, sound, and free from large knots, dry rot, worm holes and other defects likely to affect its strength.
- No rope which is defective whether through contact with acids or other corrosive substances or otherwise should be used on scaffolds.
- Where necessary, boards and planks used for scaffolds should be protected against splitting
- Ladders, boards and planks used in scaffolds should not be painted so that any defects are visible.
- Materials used in the construction of scaffolds should be stored under good conditions and apart from any material unsuitable for scaffolds.
- Fastenings on wooden scaffolds should conform with the national laws and regulations or be approved by the competent authority.
- All tubes, couplers and fittings used in metal tubular scaffolding should be of a standard and type approved by the competent authority. All couplers and fittings should be free from damage and distortion, and should be maintained in an oiled condition.
- Couplers should not cause deformation in tubes. Couplers should be made of drop forged steel or equivalent material.
- Tubes should be free from cracks, splits and excessive corrosion and be straight to the eye, and tube ends cut cleanly square with the tube axis.

Scaffolds as prescribed by national laws or regulations should be inspected, and the results recorded by a competent person:

- before being taken into use;
- at periodic intervals thereafter as prescribed for different types of scaffolds;
- after any alteration, interruption in use, exposure to weather or seismic conditions or any other occurrence likely to have affected their strength or stability.

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Inspection by the competent person should more particularly ascertain that:

- the scaffold is of suitable type and adequate for the job;
- materials used in its construction are sound and of sufficient strength;
- it is of sound construction and stable;
- that the required safeguards are in position.

A scaffold should not be erected, substantially altered or dismantled except by or under the supervision of a competent person.

Every scaffold should be maintained in good and proper condition, and every part should be kept fixed or secured so that no part can be displaced in consequence of normal use.

No scaffold should be partly dismantled and left so that it is capable of being used, unless it continues to be safe for use.

Ladders

- Handmade ladders are forbidden.
- The ladders will be checked daily before usage and controlled by the maintenance team and tagged.
- Ladder steps will be clean and anti-slide.
- There will be insulating caps on the ends of the ladders; ladders without caps will not be removed from the site.
- Ladders will not be considered as working platforms and no work will be performed on ladders more than 15 minutes.
- Ladders will be installed at 1:4 and it will be 90 cm longer than the climbed level.
- Last two steps of the ladders will not be used.
- Damaged ladders or ladders with broken steps will be removed from the site and those ladders will be notified to the maintenance team.
- When climbing, 3-point rule (two hands and a foot, or two feet and a hand) will be maintained at all time. While climbing and going down, manual handling is forbidden.
- Conductive (metal) ladders will not be used in electrical works and in areas where power lines are present. In such works and areas, fiberglass and nonconductive ladders will be used.
- The ladders will not be used in strong windy weathers. Strong wind speed is determined as 12 m/s unless otherwise specified.
- The ladders will not be placed at door entrances. If it is inevitable to do so, the door will be locked.
- The ladders will not be placed on ice or snow. If it is necessary to do so, it will be fixed.
- The ladders will not be placed at places where there is active traffic. If it is necessary to do so, appropriate barriers and warning signs will be placed. This measure must be effective enough to remove vehicle crash risks.
- While there is an employee on the ladder, it is forbidden to change the position or location of it.
- Ladders will be carried horizontally to minimize the chance of its contact with power lines.
- Ladders will only be used for their purpose of manufacture. Ladders will not be used in a horizontal position like a walking platform, bridge, etc.
- There will be a minimum gap of 18 cm between the steps, and between the ladder and wall (or another fixed part).
- The distance between the steps will be equal and never exceed 30 cm.
- Worn-out or damaged ladders will not be used.

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4.1.8. Working at Height

Workers are considered "working at height" when they work at a height difference and are at risk of falling. This includes when they walk, perform stationary work, or are at risk of falling from a surface that is not protected by approved guardrails, barriers, or other approved restraint or holding devices. The dangerous distance for falling is measured from the worker's feet to the pedestrian/work platform.

Excluding work at height by maximizing work on the ground or increasing the volume of work by pre-assembling construction elements on the ground reduces the risks of falling. However, due to the specific nature of the work carried out in the context of this bridge construction project, it is not possible to completely eliminate work at height.

The implementation of fall prevention and protection systems, such as guardrails, fall protection devices, fall protection systems, barricades, etc., can help reduce these risks. Depending on the work being performed, the most effective system should be chosen.

Where possible, lifting equipment such as suspended cranes or scissor lifts can be used when employees need to be 100% tied off while performing work.

The use of protective equipment (helmets, vests, safety systems) is mandatory. It is necessary to work with a partner.

Clear instructions for working at height should be developed and communicated to all construction workers and other workers on site.

4.1.9. Lifting Operations

Operations related to lifting loads should be included in the Construction Site Vehicle and Equipment Safety Rules and Measures and in the Procedures for Preventing Falling Object Injuries. Mitigation measures regarding lifting operations are provided below:

- Before lifting machinery and vehicles start to work, they shall be checked by their operators. The steel ropes, chains, hooks, sling, chain blocks, and automatic stoppers shall be checked by authorized technical personnel once a year. This period might be shortened by risk assessments.
- The crane that will be used during lifting operations shall be accepted in accordance with site acceptance rules.
- Minimum requirements of the crane are crane license (official registration certificate),periodic maintenance documentation, operation of the detection devices, condition of the operator cabin, presence of at least fire extinguisher and first-aid kit
- Minimum requirements of the operator are operator license, insurance of the operator, the medical condition of the operator, induction training of the operator and PPE usage of the operator.
- Before starting the lifting operation, the whole area or the area where the load will travel shall be enclosed with barriers to protect working under the load. If this is not possible, the area shall be controlled by several watchmen.
- Standing under the suspended load is forbidden in any case. If it is necessary to do so, the risks to people must be minimized by safe systems of work and appropriate precautions.
- The lifting shall be performed by tying down the load by a trained rigger.
- Even though the operation can be performed by only one rigger, another rigger with greater experience can be used as superintendent together with several flagmen.

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- If the flagmen are more than one, the operator shall follow the only one flagman's instructions and this flagman shall be selected before the operation starts.
- The communication method between the flagman and operator shall be determined before the operation by considering any malfunctions in communication devices. For the lifting with high risks or for human lifting, free heave and barge are forbidden by considering the risk of communication gaps.
- Riggers, flagmen and superintendent shall start to the work as trained in lifting operations. This shall be recorded in the Training Plan.
- The operation shall not start without lifting plan and the lifting plan shall be prepared by superintendent or engineer.
- Minimum requirements of the lifting plan are installation plan of crane(s),weight of the load, certificates of lifting equipment, required environmental conditions (wind, temperature, etc.) and demonstration of the movement of the load on drawing.
- The operation area shall be enclosed with barriers and unauthorized access will be prevented.
- It is important to leave 25% safety margin in lifting accessories.
- Work Permit shall be taken for the lifting operation to be carried out under power lines.
- The lifting accessories that are found to be unsuitable shall be removed from the site.
- The lifting equipment shall be properly collected and kept in a clean condition.
- All lifting operations shall be performed in accordance with the crane manufacturer's instruction manual.
- The load that will be lifted shall be controlled prior to the operation and a proper configuration according to the load scale shall be selected.
- In the lifting process, the supporting legs of the crane shall be opened as long as there is no other manufacturer advice exists. In that case, a case-specific risk assessment together with a lifting plan shall be performed.
- Under the supporting legs of the crane, manufacturer-approved pads shall be placed. In cases, the pad features are not specified by the manufacturer, 70cm x 70cm pads shall be placed and without placement of pads, no lifting operation shall be performed.
- Grounds not suitable for lifting operation shall be enclosed with barriers or other suitable tools and marked. This information shall be shared with the operators.
- If conditional lifting operation is envisaged on a poor bearing ground, the strength of the ground shall be written on the floor.
- Lifting operations shall be carried out at the wind limits allowed by the manufacturer. If there is no such limit, maximum wind limit is assumed as 12 m/s.
- The maximum wind limit is assumed as 7 m/s for materials such as plates where the wind effect will be strong.

4.1.10. Welding Works

Welding work can pose several hazards, including exposure to hazardous fumes, gases, as well as the risk of fire and explosions.

The danger of welding work extends not only to the welder who performs the job but also to those who work nearby. The risk includes damage to the eyes, damage to the skin, burns, and inhalation of toxic gases.

To address these hazards, the following mitigation measures should be implemented for welding works:

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- Ventilation: Adequate ventilation must be provided to control exposure to welding fumes and gases. This can be achieved through natural ventilation or mechanical ventilation systems, such as local exhaust ventilation (LEV) that captures and removes fumes and gases at the source.
- Personal protective equipment (PPE): Workers should wear appropriate PPE, such as respiratory protection, eye protection, and protective clothing, to protect against welding fumes, radiation, and burns.
- Training: Workers should receive training on safe welding practices, including how to use PPE, proper ventilation techniques, and safe handling of welding equipment.
- Fire prevention: Welding work creates a risk of fire and explosions, so fire prevention measures must be in place. This includes maintaining a clean work area, keeping flammable materials away from the work area, and having fire extinguishers readily available.
- Equipment maintenance: Regular maintenance and inspections of welding equipment should be performed to ensure its safe operation and to identify any potential hazards.
- Work area safety: The work area should be clearly marked and barricaded to prevent unauthorized access. Workers should also be trained on safe work practices, such as not welding in confined spaces or on wet surfaces.

By implementing these mitigation measures, the risks associated with welding work can be minimized, and a safe working environment can be created for workers.

4.1.11. Working Near Water Object

Working in close proximity to water poses several hazards, such as drowning, hypothermia, and electrical shock.

Workers should be provided with appropriate personal protective equipment (PPE) and rescue equipment, such as life jackets, waders, and waterproof clothing, to protect them from water-related hazards. The type of PPE needed will depend on the nature of the work being performed and the potential hazards present.

There are several types of rescue equipment that can be used in emergency response near water. Examples include lifebuoys, throw ropes, rescue boats, rescue poles, rescue buoys, personal flotation devices (PFDs), rescue harnesses, and diving equipment. The selection of rescue equipment will depend on the nature of the work being performed, the location, and the potential hazards present.

Emergency response protocols should be developed and communicated to all workers. These protocols should include the establishment of an emergency response team, first aid procedures, communication systems, rescue plans, and regular emergency drills. Workers should be assigned specific roles and responsibilities in case of an emergency, and procedures should be in place to ensure that workers can respond quickly and safely in case of an emergency.

4.1.12. Manual Handling

Manual handling refers to any task that involves lifting, carrying, pushing, pulling, or moving objects or people by hand or bodily force. Manual handling can also pose a risk of injury to workers if not carried out correctly.

To prevent injuries and ensure safe manual handling practices, workers should receive training on how to lift and move objects safely. Training should cover:

- The correct lifting technique, including how to bend your knees and keep your back straight.

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- How to assess the weight and size of an object before lifting it.
- How to use equipment such as trolleys, hoists, or lifting aids, if available.
- How to identify hazards and risks associated with manual handling tasks.
- How to report any incidents or near-misses related to manual handling.

By providing workers with appropriate training, employers can reduce the risk of injuries and ensure that workers are able to carry out manual handling tasks safely and efficiently.

4.1.13. Working with Tools and Equipment

It is necessary to provide training/preparation for workers on safety measures when working with tools and equipment, which must always be in good condition. The worker must follow these guidelines when working with tools and equipment:

- Perform only the assigned work for which the worker has received instructions on occupational safety.
- Be sure to read the manual for the tool and equipment
- Use only the tools and equipment that the worker has been trained to use safely for the task.
- Utilize personal protective equipment correctly.

4.1.14. Hazardous Materials Handling

Measures shall be taken to avoid or minimize the potential for occupational exposure to hazardous materials and substances that may be used during project. Mitigation measures regarding hazardous materials are presented below:

- All hazardous materials shall be assessed in accordance with relevant regulatory and international requirements.
- All chemicals purchased from suppliers used on the site will be accompanied by their MSDSs that meet the standards.
- Storage of fuel will be in tanks equipped with locking devices and which have secondary containment (with %110 volume capacity) that are located on a platform in a designated area located away from any watercourse or drain.
- Spill kits, protective equipment, and other necessary equipment will be available where hazardous materials are handled, to enable any spills to be cleaned up.
- Appropriate first aid will be located close to hazardous material storage areas such as eyewash, showers, and first aid kits.
- Hazardous materials will only be transported in vehicles authorized for the transport of hazardous substances.
- The transfer of hazardous materials from vehicles to storage tanks shall be conducted on impervious hard standing, which is sloped to a collection or a containment structure, not connected to municipal wastewater/storm water collection system.
- Incompatible materials (acids, bases, flammables, oxidizers, reactive chemicals) shall be stored in separate areas, and with containment facilities separating material storage areas.
- The storage and use of hazardous substances shall be done under conditions of maximum security.
- Drummed hazardous materials shall be stored in areas with impervious surfaces that are sloped to retain any spills/leaks.
- Containers holding flammable and/or toxic materials will be kept permanently closed and covered. They shall be kept in their original packaging and they shall be handled and transported under maximum security.

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- Any accidental leaks of fuel or oil will be immediately cleaned up with absorbent material and collected in closed and labelled containers - temporarily stored in specially designed spaces until delivery to an operator.

All Hazardous Materials shall be disposed of according to the requirements of relevant regulation.

4.1.15. Work with Electricity

Measures to prevent, minimize and control electrical hazards that might result from electrical works, equipment and/or hand tools are presented below:

- All energized electrical devices and lines will be marked with warning signed.
- Devices will be locked-out and tagged-out during service and maintenance.
- Locked-out and tagged-out awareness will be provided by HSE Manager before the work.
- All electrical cords, cables and hand power tools for worn-out or exposed cords and manufacturer recommendations for the maximum permitted operating voltage of the portable hand tools will be checked.
- Power cords and extension cords will be protected against damage.
- Only approved extension cords will be used.
- No approach zones around or under high voltage power lines will be established.
- Rubber tired construction or other vehicles that come into direct contact with, or arching between high voltage wires will be taken out of service for periods of 48 hours and the tires will be replaced to prevent catastrophic tire and wheel assembly failure potentially causing serious injury or death.
- Detailed identification will be performed and all buried electrical wiring before any excavation work will be marked.
- Flexible cords to be used on construction site will be rated as heavy duty, and those cords will be either protected by a suitable enclosure or barrier or located where protected from mechanical damage, damaged by liquids or high temperature.
- Cords will not exceed the maximum length stated in the related regulations.
- Hazard warning lights will be installed inside electrical equipment enclosures to warn of inadvertent energization.
- Appropriate labelling of service rooms housing high voltage equipment and where entry is controlled or prohibited will be ensured.
- Voltage sensors will be used before and during workers' entrance into enclosures containing electrical components.
- Specialized electrical safety training will be given to those personnel working with or around exposed components of electrical works.
- Deactivation and proper grounding of live power equipment and distribution lines according to applicable legislation and guidelines whenever possible before work will be performed.
- Electrical hand tools will be inspected by a qualified electrician every three months and by workers any time before starting the work.
- Electrical equipment that does not have a control mark on it will not be used.
- Electrical equipment shall only be repaired by electricians.
- Protective parts of any electrical hand tool will not be removed.
- After the completion of work, electrical hand tools will be kept with pulling their plug out to prevent trip and falls.
- When the work with electrical hand tool is finished, it will be returned to its storage place.
- The employees that will use the electrical hand tool will be trained.

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- The employees conducting electrical works or using electrical equipment and tools will use the relevant PPE.

4.1.16. Fire Prevention and Fire Fighting

Employers should take all necessary measures to prevent the risk of fire, control any outbreak of fire quickly and efficiently, and ensure a safe evacuation of all persons. Sufficient and appropriate storage should be provided for flammable liquids, solids, and gases, and secure storage areas should be established to deter trespassers.

Smoking should be strictly prohibited, and "No Smoking" signs should be prominently displayed in all places containing readily combustible or flammable materials. In confined spaces and other areas where flammable gases, vapors or dusts can cause danger, only suitably protected electrical installations and equipment should be used. Naked flames or similar means of ignition should be avoided, and signs prohibiting smoking should be posted. Oily rags, waste, clothes, or other substances prone to spontaneous ignition should be removed immediately to a safe place, and adequate ventilation should be provided.

Accumulation of combustible materials such as packing materials, sawdust, greasy/oily waste, and scrap wood or plastics should be prevented in workplaces, and they should be kept in closed metal containers in a safe place. Regular inspections should be conducted in places where there are fire risks, including the vicinity of heating appliances, electrical installations and conductors, stores of flammable and combustible materials, and hot welding and cutting operations.

Welding, flame cutting, and other hot work should only be performed on the orders of a competent supervisor after appropriate precautions are taken to reduce the risk of fire. Suitable and sufficient fire-extinguishing equipment should be provided, which should be easily visible and accessible, and an adequate water supply at ample pressure should be available if necessary to prevent the danger of fire. The fire-extinguishing equipment should be properly maintained and inspected at suitable intervals by a competent person, and access to the equipment should be kept clear at all times.

All supervisors and a sufficient number of workers should be trained in the use of fire-extinguishing equipment, and workers should be trained in the action to be taken in the event of a fire, including the use of means of escape. Suitable visual signs should be provided to indicate clearly the direction of escape in case of fire, and means of escape should be kept clear at all times. Notices should be posted in conspicuous places indicating the nearest fire alarm and the telephone number and address of the nearest emergency services.

Providing firefighting equipment at construction sites, camp sites, and near fuel storage areas is a crucial aspect of fire safety management. Firefighting equipment such as fire extinguishers, fire hoses, fire blankets, and sprinkler systems should be made available in case of a fire outbreak. It is important to ensure that the equipment is in good working condition, regularly inspected, and properly maintained. Workers should be trained on how to properly use the equipment and what to do in case of a fire outbreak, and regular fire drills and simulations should be conducted to prepare workers for emergencies and ensure they know how to respond appropriately.

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4.1.17. Working in Flammable and Explosive Environments

Risk assessment shall be performed before working in flammable and explosive environments. Necessary signs should be placed on the site. Emergency communication numbers shall be placed.

- Flammable and explosive liquid storage shelves and barrels shall be earthed against static electricity hazards. Static electricity is the most important fire cause.
- Hot works such as welding, cutting etc. shall not be performed near flammable and explosive liquids. Special precautions shall be taken when it is necessary to do so.
- It shall be ensured that there is no spill, leakage etc. where flammable and explosive liquids are present.
- Fire extinguishers shall be placed to appropriate locations where there is a work with flammable and explosive liquids.
- Training shall be conducted on the use of fire extinguishers.
- The storage areas of flammables and explosives shall have ventilation and the area shall be ventilated.
- Flammable and explosive materials shall be stored in their original packages. For small usage quantities, they shall be carried with special safety containers.
- Gasoline and thinner shall not be used in cleaning works. Non-flammable solvents shall be used.

4.1.18. Working Near Overhead or Underground Essential Services

Working near overhead or underground essential services is an important consideration for the health and safety plan for the construction of a road project. These services can include electrical, gas, water, or telecommunication lines, and pose a significant risk to workers if proper precautions are not taken.

4.1.19. Work with Machinery / Equipment

Plant, machinery and equipment, including hand tools, both manual and power-driven, should:

(a) be of good design and construction, taking into account, as far as possible, health and safety and ergonomic principles;

(b) be maintained in good working order;

(c) be used only for work for which they have been designed unless a use outside the initial design purpose has been assessed by a competent person who has concluded that such use is safe;

(d) be operated only by workers who have been authorized and given appropriate training;

(e) be provided with protective guards, shields, or other devices as required by national laws or regulations.

Adequate instructions for safe use should be provided where appropriate by the manufacturer or the employer, in a form understood by the user.

Operators of plant, machinery, and equipment should not be distracted while work is in progress.

Plant, machinery, and equipment should be switched off when not in use and isolated before any major adjustment, cleaning, or maintenance is done.

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Where trailing cables or hose pipes are used, they should be kept as short as practicable and should not create a safety hazard.

All dangerous moving parts of machinery and equipment should be enclosed or adequately guarded in accordance with national laws and regulations.

Every power-driven machine and equipment should be provided with adequate means, immediately accessible and readily identifiable to the operator, to stop it quickly and prevent it from being started again inadvertently.

The machines or equipment should be designed or fitted with a device to ensure that the maximum safe speed, which should be indicated on it, is not exceeded. If the speed of the machine is variable, it should only be possible to start it at the lowest appropriate speed.

Operators of plant, machinery, equipment, and tools should be provided with personal protective equipment, including, where necessary, suitable hearing protection.

4.1.20. Noise and Vibration

In the construction and operation phases of the Project, noise sources include machinery and equipment. Mitigation measures for reducing noise in both the construction and operation phases, including measures against occupational noise exposures, are provided below:

- Equipment will be selected with lower sound power levels.
- Silencers will be installed where possible.
- High noise areas will be identified and marked, and personnel will wear personal noise-protecting gear at all times when working in such areas, where the noise level is over 85 dBA. Structures will be designed and constructed with effective noise isolation.
- No employee will be exposed to a noise level greater than 85 dBA for more than 8 hours per day without hearing protection.

Mitigation measures to minimize the impact of vibration are listed below:

- Tools and equipment with lower vibration levels will be selected.
- Protective clothing to keep the employees warm and dry will be supplied.
- Task rotation and time limits will be implemented for activities with high exposure levels.
- The right equipment for works with risks will be provided and well-maintained in good condition.
- Information on self-protection and training will be provided to employees regarding tool maintenance and usage, for example, avoiding gripping the tool too tightly.

4.1.21. Working Environment Temperature

Mitigation measures for the prevention and control of occupational exposure to heat during the Project activities are listed below:

- The time required for work in elevated-temperature environments will be reduced, and access to drinking water will be ensured.
- Surfaces where personnel come in close contact with hot equipment will be shielded.
- Appropriate warning signs and personal protective equipment (PPE) will be used near high-temperature surfaces and environments.

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4.1.22. Ergonomics

Workers will be provided with the appropriate tools, equipment, parts and materials. The control and identification of ergonomic risk factors and reduction of hazards will be achieved through the following means when and where necessary:

- Engineering controls: These are the most reliable means of controlling or preventing injury. It involves focusing on the physical modifications of jobs, workstations, tools, equipment, or processes.
- Administrative controls: This entails controlling or preventing injury by implementing administrative changes such as job rotation, job enlargement, rest/recovery breaks, work pace adjustment, redesign of methods, and/or worker education.

4.2. Health Protection and Prevention

Providing training to employees on first aid and disease prevention measures is crucial to maintaining a safe and healthy workplace. In case of an accident or medical emergency, it is important for employees to have the necessary skills to provide immediate assistance and potentially save lives. First aid courses teach employees how to recognize and respond to various medical emergencies, including cuts, burns, fractures, and cardiac arrest.

In addition, training on disease prevention measures is essential to ensure that employees are aware of the risks of infectious diseases and how to prevent their spread. This includes recognizing the signs and symptoms of infectious diseases such as tuberculosis (TB), HIV/AIDS, venereal diseases/STIs, and COVID-19, as well as knowing how to take preventive measures to reduce the risk of infection.

The training should cover procedures for medical examination, first aid, and medical evacuation in the event of an accident, as well as measures to prevent the spread of infectious diseases. It is important to ensure that all workers attend the training to promote a culture of safety and health in the workplace.

4.2.1. Medical Examination and First Aid Medical Examination

In Tajikistan, medical examinations of workers are mandated by law to ensure the health and safety of employees in the workplace. According to Tajikistan's labor regulations, every worker is required to undergo a compulsory general medical examination. However, the extent and frequency of these medical examinations may vary depending on the nature of the work and the specific tasks performed by the employees.

For workers engaged in critical tasks from a safety perspective, a more rigorous and thorough medical examination is required. These critical tasks encompass various high-risk activities, such as operating specialized machinery, heavy equipment, and vehicles, including cranes, aerial lifts, dump trucks, and other construction-related machinery. Additionally, specific types of work, such as working at heights, tunnel excavation, and installation of metal structures, are also considered critical tasks in terms of safety.

To comply with Tajikistan's laws, employers are responsible for organizing and facilitating these medical examinations for their workers. The examinations aim to identify any existing health conditions or potential risks that may impact the employee's ability to perform their duties safely. By conducting these medical assessments, employers can take appropriate measures to safeguard the health and well-being of their workforce and prevent workplace accidents and injuries.

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Furthermore, the medical examinations may also include assessments of workers' physical fitness and mental health, particularly for jobs that involve high levels of physical exertion or mental stress. This comprehensive approach to medical examinations helps ensure that workers are fit to perform their assigned tasks and can contribute to a safer working environment overall.

he results of a thorough medical examination are protected by doctor-patient confidentiality, which medical personnel, therapists, and patients themselves are obligated to uphold on the workplace. However, the employer has the right to obtain a medical opinion on the professional suitability of a specific worker.

4.2.1.1. First Aid and Emergency Care

First aid and emergency care are critical components of any comprehensive health and safety plan for a construction project. The first step in establishing a first aid program is to identify potential hazards present on the work site. This identification helps determine the specific first aid supplies and equipment needed, such as bandages, gauze, antiseptics, splints, and eye wash stations. The location and number of first aid kits should be clearly communicated to all workers.

In addition to providing the necessary supplies, trained personnel must be available on site to administer first aid when required. All workers should be trained in basic first aid and CPR. There should also be a designated individual or team responsible for providing immediate assistance in case of accidents or injuries. The employer bears the responsibility of ensuring access to first aid, arranging for medical attention for injured workers, and providing trained personnel for emergencies.

Regular drills and training sessions are crucial to familiarize all personnel with the location and use of first aid supplies and equipment. Restocking and checking first aid supplies regularly are also essential to maintain readiness.

A well-defined protocol for reporting accidents and injuries should be in place, and any incidents should be reported immediately to the designated first aid personnel. Keeping records of accidents and injuries helps identify trends and improve the overall health and safety plan.

Rescue and resuscitation equipment, including stretchers, should be readily available at the construction site, especially in areas with risks of drowning, asphyxiation, or electric shock. First-aid kits or boxes should be present at workplaces, including remote locations, and on vehicles and boats, protected from contamination, and equipped with simple instructions. Qualified personnel should be responsible for managing these kits, ensuring they are inspected regularly and adequately stocked.

A suitably equipped first-aid room or station should be readily accessible, manned by qualified first-aid personnel or a nurse. This space is essential for treating minor injuries and providing a resting place for seriously ill or injured workers.

Health protection measures should include actions in the event of:

- Sudden loss of consciousness (e.g., epilepsy, certain heart conditions, diabetes, especially insulin-dependent);
- Impairment of consciousness or loss of concentration;
- Sudden loss of ability to function;
- Impaired balance or coordination;
- Limited mobility; and
- Impairment of vision or hearing functions.

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In addition to the mentioned actions, it is crucial to establish clear protocols and guidelines for immediate response to any of these situations. Training all personnel on the proper procedures and ensuring the availability of necessary medical equipment can significantly improve the handling of emergencies related to health conditions. Regular drills and exercises can also reinforce the preparedness of the workers and help them respond effectively in critical situations. Furthermore, maintaining up-to-date medical records and conducting periodic health assessments can aid in identifying employees who may require special accommodations or additional support to ensure their well-being and safety at the workplace.

4.2.1.2. Medical Service

Medical service (medical facility) should be provided and properly equipped on the construction site. This responsibility falls under the contractor's scope of duties.

The emergency preparedness plan should clearly define and assign responsible personnel with their contact information, identify backup centers for first aid, clinical hospitals, and evacuation procedures. Agreements should be made with clinical hospitals to ensure cooperation and swift response in case of emergencies. By having a well-prepared medical service and evacuation plan, the construction site can effectively handle health-related incidents and ensure the prompt and appropriate treatment of any injured or ill workers.

4.2.2. Plan for Preventing Infectious and Socially Determined Diseases

During the first week of work, all workers must attend a training on infectious diseases (tuberculous, HIV/AIDS, and venereal diseases, COVID-19 and other related diseases). The training will cover topics such as the modes of transmission, how to recognize symptoms, what should be done, and what preventive measures exist.

Furthermore, strict adherence to the hygiene rules mentioned in the previous section also contributes to reducing the spread of infectious diseases, both respiratory and gastrointestinal. Additionally, the contractor must ensure free vaccination for workers who do not have immunization against diseases such as tetanus, poliomyelitis, hepatitis A, influenza, COVID-19, pneumococcal infection, and others based on epidemic indications.

4.2.2.1. COVID-19

COVID-19 is an acute viral disease primarily affecting the respiratory system. It can be transmitted through various routes, including airborne transmission during coughing, sneezing, or speaking, as well as through contact with contaminated surfaces. The virus can be spread when infected individuals touch their mouth, nose, or eyes with contaminated hands.

As the world recovers from the COVID-19 pandemic, it remains crucial to consider safety measures to protect workers and stakeholders.

Some strategies that should be included in the OH&S Plan are could include:

- Compliance with National Laws and Regulations: The project must adhere to all relevant national laws and regulations related to COVID-19 prevention and control. This includes guidelines issued by the government and health authorities.

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- Good International Industry Practice (GIIP): The project should adopt and implement Good International Industry Practice guidelines for managing COVID-19 risks in the workplace.
- WHO Guidelines: The project should be guided by the specific guidelines on COVID-19 issued by the World Health Organization (WHO). This includes adherence to the International Health Regulations and the Emergency Response Framework.
- Occupational Health and Safety Training: The contractor is responsible for providing comprehensive training to project workers on COVID-19 preventive measures, including hygiene practices, proper use of personal protective equipment (PPE), and social distancing protocols.
- Communication Strategy: Implement a clear and effective communication strategy that ensures workers receive regular updates on COVID-19-related issues, the status of any worker affected by the illness, and a platform to report issues, ask questions, and submit requests related to COVID-19.
- Provision of Personal Protective Equipment (PPE): Project workers should be provided with adequate and appropriate PPE required to carry out their duties safely. This may include masks, gloves, face shields, and other necessary protective gear.
- Protocol for COVID-19 Cases: Develop and implement a clear protocol to be followed in the event that any project worker contracts COVID-19. This should include procedures for reporting, isolation, contact tracing, and necessary medical attention.
- Physical Distancing Measures: Implement physical distancing measures in work areas, restrooms, dining facilities, and other common areas to minimize the risk of transmission.
- Regular Sanitization and Cleaning: Ensure that work areas and frequently-touched surfaces are regularly sanitized and cleaned to maintain a safe environment.
- Health Monitoring: Regularly monitor the health status of workers through temperature checks and health assessments. Any worker showing symptoms or signs of illness should be isolated and referred for medical evaluation.
- Travel Guidelines: Implement travel guidelines that adhere to national and international travel regulations and consider the risk of exposure during travel.
- Mental Health Support: Provide mental health support to workers to help cope with the stress and uncertainties caused by the pandemic.
- Regular Review and Updates: Continuously review and update the COVID-19 prevention measures based on the latest guidelines and recommendations from health authorities.

By adhering to these requirements, the project can minimize the risk of COVID-19 transmission among workers and create a safe and healthy working environment.

4.2.2.2. HIV/AIDS, and Venereal Diseases

Ensuring the health and well-being of workers includes measures to prevent the transmission of HIV/AIDS and venereal diseases. These infections can have severe consequences for individuals and communities, making it essential to implement comprehensive preventive strategies.

The key measures can include but not limited to:

Education and Awareness: Conduct regular educational programs to raise awareness about HIV/AIDS and venereal diseases among all project workers. Provide detailed information about transmission modes, prevention methods, and the significance of early detection and treatment.

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Safe Sex Practices: Promote the adoption of safe sex practices, emphasizing the consistent and correct use of condoms. Encourage open discussions about sexual health and reduce stigmatization related to condom usage.

Regular Testing: Facilitate and encourage regular testing for HIV/AIDS and venereal diseases for all workers on the construction site. Ensure confidentiality and privacy during testing to foster a supportive environment.

Provision of Protection: Make condoms and other barrier methods readily available to workers. Ensure easy access to these protective resources, which are essential in reducing the risk of infection.

Infection Control Training: Conduct training sessions on infection control to minimize the risk of transmission in case of accidents or injuries. Teach workers proper handling and disposal of medical waste.

Anti-Discrimination Policies: Implement strict policies that prohibit discrimination against workers living with HIV/AIDS or venereal diseases. Foster an inclusive work environment that supports those affected.

First Aid Training: Provide comprehensive first aid training to designated personnel to handle accidental exposures to blood or body fluids that may carry HIV/AIDS or venereal diseases.

Access to Healthcare: Guarantee access to healthcare facilities and services for the management and treatment of HIV/AIDS and venereal diseases. Establish partnerships with medical institutions for expedited medical attention if required.

Confidentiality and Privacy: Protect the confidentiality and privacy of workers living with HIV/AIDS or venereal diseases. Ensure that their health status is not disclosed without their explicit consent.

4.2.2.3. Tuberculosis

Tuberculosis (TB) prevention and examination are crucial components of ensuring the health and safety of workers. TB is an airborne infectious disease that can spread through the air when an infected person coughs or sneezes.

Regular health screenings and examinations should be conducted for all construction workers to detect TB infections early and provide timely treatment. Additionally, workers should receive education and training on TB prevention, symptoms, and the importance of seeking medical attention if they experience any respiratory symptoms or other signs of TB infection.

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2 ROLES AND COMMUNICATION

4.3. Roles and Responsibilities for Health and Safety on Construction Sites

To effectively reduce risks associated with OH&S and create a safe working environment, it is essential to have a clear understanding of the roles and responsibilities of key stakeholders involved.

The table below presents the key stakeholders engaged in health and safety, along with their respective duties. These roles include the Health, Safety, and Environment (HSE) Manager, Occupational Physician, Employees, Contractors/Subcontractors, and Visitors. Each of these stakeholders plays a vital role in maintaining a safe and healthy work environment at the construction site.

Roles	Responsibilities
Health, Safety and Environment (HSE) Manager	• Developing and implementing OHS policies, procedures and guidelines. • Conducting risk assessments to identify and control hazards and risks associated with the construction of the bridge and roads. • Developing and delivering OHS training to employees and contractors, including safety induction and ongoing training programs. • Monitoring and inspecting the worksite to ensure compliance with OHS policies and procedures. • Investigating incidents, near misses and accidents, and implementing corrective actions to prevent future incidents. • Maintaining accurate records of OHS performance, including accident and injury statistics, and reporting on OHS performance to senior management. • Developing and implementing emergency response procedures, including evacuation plans and procedures for dealing with potential hazards and emergencies. • Regularly reviewing and updating the OHS plan to ensure it remains relevant and effective.
Occupational Physician	• Providing medical support to the workers, ensuring their physical and mental well-being during the construction process. • Conducting regular health check-ups for the workers to identify and prevent any work-related illnesses or injuries. • Providing medical treatment to workers in case of any occupational accidents or diseases. • Advising management on measures to improve

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	occupational health and safety, including risk assessment and implementation of control measures. • Monitoring the workers' health status and maintaining accurate and complete records of their medical histories. • Collaborating with the OHS team to identify and address health and safety concerns and ensuring that appropriate medical facilities are available at the worksite. • Keeping up-to-date with the latest developments in occupational health and safety and ensuring that the workers receive the necessary training and support to maintain their health and safety while on the job.
Employees	• Following all health and safety policies and procedures and reporting any concerns or incidents to the relevant authorities. • Participating in training programs to increase knowledge and understanding of occupational health and safety. • Using personal protective equipment (PPE) as required and maintaining it in good condition. • Being vigilant in identifying and reporting any potential hazards or safety risks. • Taking proactive measures to prevent accidents and injuries in the workplace. • Cooperating with the employer and other stakeholders to maintain a safe and healthy work environment. • Seeking first aid or medical attention promptly in the event of an injury or illness.
Contractors / Subcontractors	• Compliance with OHS regulations and guidelines: Contractors are responsible for adhering to all OHS regulations and guidelines as specified in the OHS plan, as well as any applicable legislation. • Implementation of OHS procedures: Contractors are responsible for implementing all OHS procedures as outlined in the OHS plan, including procedures for managing hazards, identifying and controlling risks, and reporting incidents. • Employee training: Contractors are responsible for providing their employees with the necessary training and resources to perform their jobs safely, including training on the OHS plan, emergency procedures, and the use of personal protective equipment. • Hazard identification and control: Contractors are responsible for identifying and controlling hazards associated with their work, and for ensuring that

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	employees are aware of and understand these hazards. • Reporting of incidents: Contractors are responsible for reporting all OHS incidents that occur on the construction site, including near misses, accidents, and injuries. • Collaboration with other stakeholders: Contractors are responsible for collaborating with other stakeholders, such as the project owner, the OHS team, and other contractors, to promote a safe working environment and to achieve the goals of the OHS plan.
Visitors	The roles and responsibilities of visitors on a construction site can vary depending on the specific context and the type of visitor. However, some common expectations for visitors may include: • Adhering to the site's OHS policies and procedures • Wearing the required personal protective equipment (PPE) • Not engaging in activities that could pose a safety risk to themselves or others • Reporting any safety hazards or incidents to the OHS team or site management • Following the guidance and instructions of the site's OHS team or site management It is important for visitors to understand their responsibilities while on a construction site to ensure the safety of everyone involved.

5.1. Communication

Efficient communication stands as a pivotal element in the successful implementation of a comprehensive health and safety plan for a road project. By establishing clear and effective communication channels, all workers and stakeholders can be kept informed about potential hazards and safety protocols associated with the project, thereby mitigating the occurrence of accidents and injuries. Below are essential technical strategies for communication within the health and safety plan for the road project:

Communication Plan: Formulate a detailed communication plan that delineates the designated channels, protocols, and mechanisms for disseminating health and safety information to workers and stakeholders.

Training and Awareness Sessions: Provide comprehensive training and awareness sessions to all workers and stakeholders, acquainting them with potential project hazards and safety requirements to avert accidents and injuries.

Regular Safety Meetings: Conduct periodic safety meetings, toolbox talks, or safety stand-downs to reinforce safety significance, analyze accidents, near-misses, and other safety-related incidents, and address any emerging safety concerns.

Utilize Posters and Signs: Deploy posters and signs on-site to serve as reminders about potential hazards, safety protocols, and emergency procedures for both workers and stakeholders.

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Feedback Mechanisms: Establish efficient feedback mechanisms, enabling workers and stakeholders to promptly report any observed safety concerns or hazards on the project site.

Language Accessibility: Ensure accessibility of communication to workers of diverse linguistic backgrounds by providing translations and interpreters as required.

Consultation and Involvement: Promote a culture of safety by actively involving workers and stakeholders in the communication process, fostering a shared sense of responsibility for safety.

5.2. Disciplinary Measures

Disciplinary measures constitute an important component of any comprehensive OH&S plan, as they serve to reinforce the significance of adhering to safe work practices and discourage unsafe behaviors. The disciplinary measures may incorporate the following potential disciplinary measures:

Verbal Warnings: When a worker is observed not following safe work practices for the first time, a verbal warning can be administered to remind them of the correct procedures.

Written Warnings: Should a worker persistently disregard safe work practices after a verbal warning, a written warning can be issued. This documented warning should be provided to the worker, accompanied by a clear explanation of the necessary actions to rectify the situation.

Suspension: In cases where a worker repeatedly fails to comply with safe work practices, a suspension may be warranted as a more serious disciplinary measure. However, this step should be taken only as a last resort, after verbal and written warnings have been given.

Termination: For severe violations of safe work practices or repeated failure to improve despite prior disciplinary measures, termination may be considered as a final disciplinary action. Such a decision should be made carefully, with thorough documentation of the worker's conduct.

Importantly, disciplinary measures must be applied consistently and impartially to all workers, avoiding any form of discrimination or favoritism. Workers should be informed about these measures in advance and given the opportunity to address any allegations before any action is taken. The primary purpose of disciplinary measures is not to punish workers but rather to emphasize the significance of adhering to safe work practices, thereby fostering a safe working environment for all individuals involved in the road project.

3 AUDITS AND INSPECTIONS

Audits and inspections are crucial components of a health and safety plan for any construction project. Here are some important considerations for audits and inspections:

- **Frequency:** Audits and inspections should be conducted regularly to ensure that the site is in compliance with safety regulations, and to identify and address any potential hazards.
- **Scope:** Audits and inspections should cover all areas of the project site, including work areas, storage areas, traffic areas, and any other areas where safety hazards may be present.
- **Identification of hazards:** During audits and inspections, safety professionals should identify any potential safety hazards and work with the construction team to mitigate these risks.

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- **Documentation:** All audits and inspections should be thoroughly documented, including the date, time, location, and findings of the audit or inspection. This documentation should be reviewed by management and corrective action taken as needed.
- **Employee participation**: Employees should be involved in audits and inspections, and their input should be sought on ways to improve safety.
- **Third-party audits:** It is also recommended to conduct third-party audits and inspections to provide an objective review of the site's safety practices.
- **Follow-up actions:** Any deficiencies identified in audits and inspections should be addressed promptly, and corrective actions taken as soon as possible.

Audits and inspections are critical tools for identifying potential hazards and improving safety practices. By conducting regular and thorough audits and inspections, the project team can ensure the health and safety of all workers and stakeholders involved in the project.

6.1. Walk, Observe and Communicate

"Walk, Observe, and Communicate" is a strategy for promoting safety and health on a construction site that involves encouraging workers to remain vigilant and aware of their surroundings. It can be a valuable addition to the health and safety plan for the project with health mitigation measures.

Some ways to implement "Walk, Observe, and Communicate" on the construction site are:

Walk: Encourage workers to regularly walk around the construction site to identify any potential hazards or unsafe conditions. This can include looking for unguarded machinery, exposed electrical wires, or other hazards.

Observe: Encourage workers to observe and report any unsafe behavior or practices they witness, such as a worker not wearing the appropriate PPE, or using equipment improperly.

Communicate: Encourage workers to communicate any safety concerns they have with their colleagues or with site management. This can include reporting any hazards or unsafe conditions, as well as any incidents or near-misses that may have occurred.

By implementing this strategy, workers are encouraged to be more aware of potential hazards and to take an active role in promoting safety and health on the construction site. This can help to identify potential issues before they become more serious, and ensure that workers are taking the necessary precautions to stay safe on the job.

The health and safety plan should include guidelines and training on how to implement the "Walk, Observe, and Communicate" strategy, as well as regular reminders and reinforcement of its importance. Additionally, site management should provide an open and receptive environment for workers to report safety concerns and should take prompt and appropriate action to address any hazards or issues that are identified.

6.2. Weekly Safety Inspections

Weekly safety inspections are an essential part of a comprehensive health and safety plan. These inspections can help identify potential hazards and risks that may have been overlooked during initial assessments, as well as ensure that health and safety measures are being properly implemented and maintained.

Some key components could include:

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Walkthrough inspections: Inspectors should walk through the construction site, paying close attention to potential hazards, such as uneven terrain, tripping hazards, and unguarded machinery.

Documentation: Inspectors should document any hazards or risks that are identified during the walkthrough inspection, including photographs or video, and track these issues through to resolution.

Review of incident reports: Inspectors should review any incident reports that have been filed since the previous inspection, to ensure that any corrective actions have been taken and to identify any ongoing issues.

PPE: Inspectors should check that workers are wearing the appropriate PPE, such as hard hats, safety glasses, and steel-toed boots, and that PPE is in good condition.

Equipment maintenance: Inspectors should check that all equipment is in good working order, properly maintained, and that any necessary repairs or maintenance have been completed.

Review of health and safety policies and procedures: Inspectors should review the project's health and safety policies and procedures to ensure they are up-to-date and that workers are trained in these policies.

Communication with workers: Inspectors should communicate with workers on the site, to identify any additional health and safety concerns or to receive feedback on current policies and procedures.

By conducting weekly safety inspections, potential hazards can be identified and corrected in a timely manner, helping to ensure the safety of workers and the public.

The OH&S plan should include a schedule for regular weekly safety inspections and a process for documenting and addressing any identified hazards or risks.

6.3. Targeted Inspections

Targeted inspections are an important part of a comprehensive health and safety plan. These inspections are designed to identify potential hazards and risks before they cause harm to workers or the public. Here are some examples of targeted inspections that can be carried out on a construction site:

Scaffold inspections: Inspectors can check scaffolds to ensure they are erected safely, have proper guardrails and toe boards, and are not overloaded.

Fall protection inspections: Inspectors can check for proper use and maintenance of fall protection equipment, such as harnesses and lanyards.

Electrical inspections: Inspectors can verify that electrical systems are installed correctly and are in good condition, that workers are trained in electrical safety, and that electrical equipment is properly grounded and insulated.

Tool and equipment inspections: Inspectors can check for proper use and maintenance of hand-operated and power tools, as well as heavy equipment, such as cranes, excavators, and bulldozers.

Traffic management inspections: Inspectors can ensure that traffic management plans are being followed, that proper signage and barricades are in place, and that workers are trained in traffic safety.

Environmental inspections: Inspectors can monitor the construction site for potential environmental hazards, such as erosion, sedimentation, and water pollution.

Confined space inspections: Inspectors can check for proper ventilation, lighting, and rescue procedures when workers are entering and working in confined spaces.

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By conducting these targeted inspections, potential hazards can be identified and corrected before they cause harm to workers or the public. The health and safety plan for the construction of the road project should include a schedule for regular targeted inspections, and a process for documenting and addressing any identified hazards or risks.

6.4. Equipment and Tools Safety Checks

Proper safety checks help to identify potential hazards and prevent accidents from occurring. Some key points to consider for equipment and tools safety checks are:

- **Regular Inspections:** Equipment and tools should be regularly inspected by a competent person before use. This includes checking for any visible signs of damage, such as cracks, worn or frayed cords, or missing safety guards.
- **Proper Maintenance:** Equipment and tools must be maintained in good working order to ensure they function safely and effectively. This includes regular cleaning, lubrication, and calibration of equipment, as well as replacing worn or damaged parts.
- **User Training:** Workers should receive proper training on the use of equipment and tools to prevent accidents caused by incorrect use or lack of knowledge.
- **Safe Storage:** Equipment and tools should be stored in a secure location to prevent unauthorized access, theft, or damage.
- **Appropriate Use:** Equipment and tools should be used only for their intended purpose and according to the manufacturer's instructions.

It is important that all equipment pieces should be inspected before workers start using them to prevent accidents and costly repairs. Take note that defective equipment is extremely dangerous, so inspections must be done regularly by health and safety officers.

4 TRAFFIC MANAGEMENT PLAN (TMP)

The primary cause of most road accidents at the construction site is the absence of a comprehensive plan for a safe work system and the lack of proper instruction provided to workers regarding the implementation of these measures. However, the commonly observed immediate causes can be attributed to one or a combination of the following factors:

- Unsatisfactory operation and maintenance of vehicles,
- Negligence or ignoring special hazards, such as overhead power lines or earthmoving activities,
- Unauthorized passenger transportation,
- Overloading or improper loading of cargo,
- Congestion at the construction site,
- Poor transportation layout,
- Lack of proper roads in combination with uneven surfaces and debris.

The contractor will prepare a Traffic Management Plan (TMP) containing acceptable strategies for the movement of materials and personnel within and outside the construction site, including the transportation of non-standard loads. The plan will include information on the organization of traffic between points, access routes, and main existing roads, as well as planned upgrade works.

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7.1. Traffic Management

Ensuring the safety of workers near busy roads is of utmost importance. Traffic and traffic-related risks and impacts will be eliminated, minimized or prevented through the following measures:

- Adherence to all relevant legislation and established requirements is mandatory.
- On-site and off-site speed limits, as determined by national legislation, must be strictly followed by all employees.
- Installing barriers, buffer spaces, and warning signs are crucial safety measures to protect workers and motorists.
- Proper positioning of equipment and machinery should be ensured to avoid obstructing paths, and clear signage should alert motorists to the presence of construction workers ahead.
- Ensure designated parking areas are determined and traffic flow is organized within the construction site.
- Whenever possible, vehicles should have their engines turned off when not in use to reduce emissions and noise.
- To reduce traffic congestion, consider using buses to transport workers.
- Strict safe driving procedures should be followed, including providing training and instruction to operators and drivers of heavy construction equipment.
- Mandatory use of seat belts, reverse alarms, and other safety measures should be enforced.
- All operators and drivers should undergo medical examinations, and records of their training and certification should be maintained.
- All vehicles on the site must be equipped with front and rear lighting and should be well-maintained, undergoing periodic technical inspections.
- Compliance with maximum load limits is essential for safe transportation.
- Avoid occupying lanes, shoulders, medians, or sidewalk areas adjacent to traffic without approval from the Road Engineer (RE).
- Schedule and execute the work in a way that minimizes disruption to existing traffic access, and provide temporary pedestrian access when needed.
- Temporary approaches should be provided to maintain traffic access to private and public property, with advance written notice to both the RE and the property owners if work interferes with their normal passage.
- The RE has the authority to reject or rescind approval of lane or shoulder closures under specific circumstances.
- In the event of a prolonged work halt or suspension, restore excavated areas within or adjacent to the traveled way as directed by the RE.
- Maintaining low speeds while driving through or near communities is essential to minimize the risk of accidents or injuries.

This responsible approach to traffic management will contribute to a safer construction environment for all involved.

7.2. Industrial Vehicle Requirements

In addition to training drivers and promoting safe driving practices, it is vital to regularly maintain and inspect vehicles used in the project for safety. This includes checking brakes, tires, lights, and other safety features to ensure they are functioning properly.

- Unauthorized vehicles will not be allowed to enter the Project area.

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- All drivers will comply with the Highway Traffic Regulation.
- Drivers and passengers shall fasten the seat belts. Seat belts shall be fastened before driving and cannot be unfasten until the vehicle is properly parked.
- Regular and legal maintenance of the vehicles will be performed in line with the related regulations.
- Each vehicle will carry first-aid kit, fire extinguisher, reflector and spare tire.
- Overloading of the vehicles is forbidden, even if the vehicle tonnage is appropriate.
- Headlights, mirrors, windows and seat belt system of the vehicles will be operational and maintenance of those will immediately be provided when these systems have problems.
- No passenger is allowed to be carried on the back of a pickup or in heavier vehicles, or in the cabinets of construction machinery.
- Tires will be controlled regularly.
- Smoking is prohibited on vehicles.
- Cell phone usage in vehicles on the road is prohibited.

7.3. Changes to the Traffic Management Plan

A well-designed TMP is a crucial aspect of the health and safety plan for any road project. However, it is essential to regularly review and update the TMP as the project progresses and conditions evolve.

Requests for changes to the TMP must be submitted to the RE for approval. The request should include a written description of the proposed TMP change. If detours are proposed, include a copy of the signed agreement with the local government authority having jurisdiction. The agreement should document the local government authority's approval of the detour and acknowledge the Contractor's sole responsibility for the maintenance and restoration of the roadway.

Changes in traffic volume: As the project progresses, the volume of traffic in the area may fluctuate. This could impact traffic flow and necessitate a review of the TMP. If traffic volume increases, additional traffic control measures, such as temporary traffic lights or additional signage, may be necessary.

Changes in road conditions: Road conditions may change due to weather conditions, construction work, or other factors. Such changes may require adjustments to the TMP to ensure the safety of workers and road users.

Modifications to the project scope: Any changes to the project scope could potentially affect the TMP.

New stakeholders: New stakeholders, such as businesses or residents, may be affected as the project progresses. Their needs and concerns should be considered when reviewing and updating the TMP.

Emergencies: In the event of an emergency, the TMP may need to be adapted to ensure the safety of workers and road users. The TMP should include contingency measures to address unexpected events.

Lessons learned: Regularly reviewing the TMP allows for the identification of areas for improvement. Incorporating lessons learned and best practices into the TMP helps continuously enhance safety on the project site.

By conducting regular reviews and updates of the TMP for the road project, workers and stakeholders can have confidence in the effectiveness and currency of the traffic control measures, ensuring the safety of everyone involved in the project.

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7.4. Traffic Control Coordinator

The Traffic Control Coordinator (TCC) is responsible and authorized to oversee and manage all traffic operations for the Project on behalf of the Contractor.

The TCC's duties and responsibilities encompass the following:

- Supervising all traffic control operations, including those performed by subcontractors.
- Coordinating traffic control activities with subcontractors, other contractors, and utility companies.
- Ensuring the setup and removal of traffic control measures align with the requirements.
- Conducting regular traffic control inspections and submitting comprehensive written reports to the RE. These reports document the inspections, providing detailed findings and any necessary corrective actions.
- Conducting inspections during night and weekend hours to ensure compliance with the Traffic Management Plan (TMP). Similar written reports will be provided to the RE, including detailed findings and necessary corrections.
- Ensuring the proper positioning and adequate spacing of traffic control devices.
- Managing the placing road signs.
- Maintaining or replacing traffic control devices to ensure they remain in good working condition and meet the required standards. This includes replacing light bulbs and electrical components and refueling, recharging, or replacing batteries as needed.
- Eliminating excavations and lateral drop-offs or protecting them with barriers or emergency escape ramps during non-working periods.
- Ensuring routine road maintenance, such as debris removal and road cleaning, is performed regularly.
- Preventing construction operations from creating flooding or icing conditions on lanes open to traffic.
- Identifying and rectifying any traffic control deficiencies immediately.
- Safely placing vehicles, equipment, and materials stored adjacent to the road behind barriers or at an adequate distance from the traveled way.
- Ensuring that Contractor vehicles for material delivery enter or exit the traveled way in a safe manner.
- Special attention should be given to ensuring the safe passage of livestock within the proposed access roads.

As part of the Traffic Management Plan, TCC will engage in consultations with local residents to determine safe crossing methods and locations. Additionally, further safety checks related to traffic management will be conducted in coordination with the Ministry of Transport, involving collaboration with local law enforcement authorities.

7.5. Night operations

Night work includes activities performed during the period from 30 minutes before sunset to 30 minutes after sunrise.

Night work should be avoided whenever possible. However, if it is not feasible to interrupt the technological process, measures should be implemented to minimize risks caused by insufficient illumination.

At least 24 hours before commencing night work, demonstrate to the person responsible for overseeing the work the method of achieving the specified illumination levels and visibility requirements for workers and equipment for each planned operation.

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Lighting Requirements:

Maintain the required illuminance level throughout the designated lighting area.

Ensure that all lighting equipment is in good operating condition and compliant with applicable requirements. Use freestanding portable or trailer-mounted towers that can be easily relocated as needed to keep pace with construction operations.

For mobile operations, ensure that adequate lighting and illuminance levels are maintained where the work is in progress and that the lighting adjusts to the ongoing operation. Provide sufficient fuel, spare lamps, generators, and qualified personnel to ensure continuous maintenance of the required illuminance levels during night operations. If, at any time, the minimum illuminance levels are not met, halt night operations until the required illuminance levels are restored.

Visibility Requirements for Workers and Equipment.

Ensure that workers wear a 360-degree high-visibility retroreflective safety garment.

Provide uniform lighting for the hopper, auger, screed areas of pavers, and operator's controls on all machines.

Note that conventional vehicle headlights do not meet illuminance requirements. Ensure that moving lighting equipment used for night operations has lights directed ahead and behind the equipment.

Equip moving equipment with alternating red and white conspicuity tape. Off-road equipment should have conspicuity tape along the full length of all four sides. On-road vehicles, including trailers and trailer-mounted devices, should have conspicuity tape along the full length of both sides (excluding the cab) and across the rear of the vehicle.

Take measures to prevent or minimize glare that may interfere with traffic or disturb local residents.

5 CONSTRUCTION CAMPS SAFETY

The proposed locations for the construction camps should be identified with careful consideration of the proximity to the work site, availability of utilities and infrastructure, and potential environmental impacts. The scale of the construction camps should be planned to accommodate the estimated number of workers and their daily activities. The structure of the construction camps should be designed to provide a safe, comfortable, and healthy living environment for the workers.

The establishment of temporary construction camps can pose several safety and health hazards, including:

Electrical Hazards: Electrical hazards can arise from temporary electrical installations and equipment used in the construction camps. This includes the use of generators, extension cords, and other electrical equipment that may not be properly grounded, insulated, or maintained.

Fire Hazards: Construction camps may be at risk of fires due to the use of combustible materials, improper storage of flammable liquids, smoking, cooking, and heating equipment.

Structural Hazards: Temporary structures like tents, trailers, and cabins may not be structurally sound, and there is a risk of collapse, particularly in extreme weather conditions such as strong winds or heavy snow.

Sanitation Hazards: The lack of proper sanitation facilities, such as toilets and handwashing stations, can lead to the spread of diseases.

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Chemical Hazards: Construction camps may use chemicals for cleaning, maintenance, and other purposes. These chemicals can pose a risk to workers' health if not handled and stored properly.

Noise Hazards: Construction sites and camps can be noisy due to the use of heavy machinery and equipment, which can lead to hearing loss if proper protective measures are not taken.

Ergonomic Hazards: Workers may be required to perform tasks that involve awkward postures, repetitive motions, and heavy lifting, leading to musculoskeletal disorders and other ergonomic injuries.

In general, the following considerations should be taken into account when planning construction camps:

- Accommodation: Sleeping quarters should provide adequate space and ventilation for workers, with comfortable beds and bedding, and basic furniture. The accommodation should be kept clean and tidy, and should be regularly checked for maintenance and repair needs.
- Dining and kitchen facilities: Dining areas should be provided with sufficient seating capacity, and should offer a variety of healthy and nutritious meals. Kitchen facilities should be designed to handle the expected number of meals, and should maintain high standards of hygiene and food safety.
- Sanitation facilities: Washrooms and shower facilities should be designed to accommodate the number of workers and should be maintained in a clean and hygienic condition. Proper waste disposal facilities should also be provided.
- Health and safety: Construction camps should be equipped with basic first aid facilities and should have designated staff trained in first aid. Emergency response plans should also be established, and workers should be trained to respond to emergency situations.
- Recreation: Recreation areas should be provided to allow workers to relax and participate in leisure activities.
- Security: Construction camps should be equipped with security measures, including lighting, fencing, and surveillance systems, to ensure the safety and security of workers and their personal belongings.
- Environmental impacts: Construction camps should be designed to minimize their environmental impact, such as by limiting noise pollution, water consumption, and waste generation. The waste generated by the construction camps should be properly disposed of to prevent pollution of the surrounding environment .

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Annex 6. Code of Conduct (Sample)

CODE OF CONDUCT FOR CONTRACTORS AND WORKERS HIRED UNDER THE PROJECT

The Contractor commits to ensuring the implementation of the project in a manner that minimizes any adverse impact on the local environment, communities, and its employees. This should be achieved by adhering to environmental, social, labor, and safety standards (ESHS) and ensuring compliance with relevant occupational health and safety (OHS) standards.

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The company also strives to create and maintain an environment free from gender-based violence (GBV) and violence against children (VAC), which will not be tolerated by any employee, partner, or representative of the company.

To ensure that all project participants are aware of this commitment, the Contractor undertakes to adhere to the following core principles and minimum standards of conduct, which must apply to all employees, partners, and company representatives, including subcontractors, without exception.

General Principles

- The Contractor and all employees, partners, and representatives are committed to complying with all relevant national laws, regulations, and rules.
- The Contractor is responsible for adhering to the requirements defined in the ESMP.
- The company commits to treating women, children (individuals under 18 years of age), and men with respect, regardless of their race, color, language, religion, political or other beliefs, national, ethnic, or social origin, economic status, disability, birth, or other status. Acts of gender-based violence and physical violence violate this commitment.
- The Contractor must ensure that interactions with members of the local community are based on respect and non-discrimination.
- Degrading, threatening, offensive, culturally unacceptable, or sexually provocative statements and behavior are prohibited among all company employees, partners, and representatives.
- Compliance with reasonable work instructions (including those related to environmental and social norms) is mandatory.
- The company and its employees commit to preserving and ensuring the proper use of property (e.g., prohibiting theft, negligence, or waste).
- Unlawful activities such as soil pollution, hunting, poaching in the wild, arson, spillage of diesel fuel, oils into the soil, and tree felling without permission are prohibited.

Health and Safety Principles

- The company must ensure the hiring of professionals in the field of occupational health and safety to implement the ESMP described in the tender documentation.
- The company must ensure the effective implementation of the project's Occupational Health and Safety (OHS) management plan, including wearing prescribed personal protective equipment, preventing avoidable accidents, reporting accidents of all types within the established timelines, and so on.
- The company commits to:
    - Prohibiting the consumption of alcohol during work activities.
    - Prohibiting the use of illegal substances.
    - Prohibiting smoking outside of designated places.

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- The company must provide adequate facilities on the construction site and in any premises for workers provided by the contractor for meal breaks, changing, and sanitation.
- The company will adhere to labor regulations, employment contracts, as well as occupational health and safety rules and in case of accidents, death, or disability of workers (skilled or unskilled), and will provide the compensation required by law.

Gender-Based Violence and Violence Against Children

- Acts of GBV or VAC are severe offenses and, therefore, grounds for sanctions that may include fines and/or dismissal. All forms of gender-based violence and violence, including grooming, are unacceptable, regardless of whether they occur in the workplace, its vicinity, labor camps, or workers' residences.
- In addition to company sanctions, when necessary, legal action should be taken against those who commit acts of GBV or VAC.
- Sexual contact or actions involving children under the age of 18, including through digital media, are prohibited. A mistaken belief about a child's age is not a defense. The child's consent is also not a protection or justification.
- All personnel, including volunteers and subcontractors, are strongly encouraged to report any suspected or confirmed incidents of gender-based violence (GBV) and/or violence against children (VAC) involving a colleague, whether within the same company or not.
- Managers have an obligation to report any suspected or confirmed cases of GBV and/or VAC as part of their responsibility to uphold the company's commitments and ensure accountability among their direct reports.

Prohibited Conduct

Sexual exploitation: Any abuse of a position of vulnerability, power, or trust for sexual purposes. This includes transactional sex, profiting from the sexual exploitation of another, and other forms of sexual abuse.

Sexual abuse: Any actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions. This includes sexual offenses such as attempted rape, sexual assault, and sexual activity with someone under the age of consent.

Transactional sex: The exchange of money, employment, goods, or services for sex, including sexual favors.

Sexual harassment: Unwelcome sexual advances, requests for sexual favors, or other conduct of a sexual nature that creates an intimidating, hostile, or offensive work environment.

Harassment: Unwelcome verbal, physical, or visual conduct that denigrates or shows hostility or aversion toward an individual or their relatives, friends, or associates. Harassment may interfere with an individual's work performance or affect their employment status or opportunities.

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The workplace prohibits various behaviors that are considered harassment, such as:

- Unwanted sexual advances or requests for sexual favors
- Offensive or derogatory comments or jokes about a person's sex, race, religion, age, disability, or any other protected characteristic
- Physical assault or intimidation
- Threats or insinuations that an individual's employment or other opportunities may be affected by their response to sexual advances
- Displaying sexually suggestive or offensive material in the workplace or at company-sponsored events
- Making unwanted physical contact or invading personal space
- Using technology, such as email or social media, to engage in harassing behavior
- Retaliation against an individual who reports harassment or participates in an investigation
- Rude or offensive sexual gestures
- Inappropriate touching or contact
- Unwelcome calls, letters, or emails
- Questions about past sexual history
- Jokes about sexual preference or activity
- Staring in a suggestive or offensive manner
- Sharing sexually inappropriate images or videos
- Inappropriate comments about a person's clothing, appearance, or body parts
- Offensive comments about gender identity or sexual orientation
- Sexually oriented "kidding," "teasing," or "practical jokes"
- Explicit sexual propositions
- Foul or obscene language or gestures
- Displaying foul, obscene, or sexually explicit printed or visual material, including pictures, greeting cards, articles, books, magazines, photos, or cartoons
- Physical contact such as patting, pinching, or intentionally brushing against another person's body
- Slurs, jokes, or degrading comments concerning gender, gender-specific traits, age, race, color, national origin, religion, sexual orientation, or disability.

Fraternization: Any relationship that may involve biased treatment, favoritism, or misuse of power or rank. This includes any type of voluntary sexual behavior, as well as emotional relationships that involve public displays of affection or intimacy, and the public expression of intimate relations. It's important to note that fraternization can also occur without sexual behavior or intercourse.

Implementation

To effectively put the mentioned principles into practice, the company pledges to:

- Clearly display copies of the Codes of Conduct at workers' camps, offices, and public areas within the workplace, such as waiting areas, rest zones, site lobbies, canteens, and health clinics.

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- Translate and distribute the Codes of Conduct in the appropriate languages used at the worksite and the native languages of international staff.
- Appoint a designated individual as the company's point of contact for addressing gender-based violence (GBV) and violence against children (VAC) issues.
- Develop an Action Plan, which includes essential elements like a reporting procedure, confidentiality measures, and response protocols for GBV and VAC cases.
- Ensure that all employees undergo an orientation training before beginning work on-site to acquaint them with the company's commitments to Environmental, Social, Health and Safety standards and the project's GBV and VAC Codes of Conduct.

Reporting

- If an individual experiences or witnesses any inappropriate behavior, they are strongly encouraged to inform the offender that the behavior is unwelcome and inappropriate.
- If this approach is unsuccessful or not preferred, the individual should report the behavior to their supervisor or a senior member of management.
- All reports are confidential and can be submitted anonymously. Contractor will make every effort to keep all notifications and complaints confidential and will investigate and, if necessary, take corrective and/or disciplinary action.
- It is the responsibility of every manager and employee to maintain a workplace free of sexual and other unlawful harassment, which includes preventing employees from experiencing offensive, humiliating, or exploitative sexual behavior.
- Managers must report any suspected violations of this policy, even if the employee is not under their direct supervision. Failure to report such violations may result in the manager being held accountable for their inaction.

I hereby acknowledge that I have reviewed the Company Code of Conduct above and, on behalf of the company, I commit to adhering to the standards outlined within it. I recognize my obligations and duties to uphold the project's Occupational Health and Safety (OHS) and Environmental, Social, Health, and Safety standards, as well as to prevent and address issues related to Gender-Based Violence (GBV) and Violence Against Children (VAC). I am aware that any actions contrary to the provisions of this Company Code of Conduct or failure to fulfill the requirements outlined herein may lead to disciplinary measures.

Company name: _____

Name of company representative: _____

Signature: _____

Date: _____

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Annex 7. Chance Find Procedure

Chance Find Procedure for the Project is developed to conserve the Resources of the Cultural, Archaeological Importance which could by chance be discovered at the Project Site. As one the priority concerns, the AIIB ESP (2019) requirements for the conservation of the Cultural Resources as follows:

Conserve cultural resources and avoid destroying or damaging them under the Project by using field-based surveys that employ suitably qualified and experienced experts for the assessment. Address cultural resources as an element of the ESMP or ESMPF (or both, is applicable). In the case of complex situations, prepare, as appropriate, a cultural resources management plan, which may be included in the ESMP or ESMPF or be self-standing. Provide for the use of "chance find" procedures that include a pre-approved management and conservation approach for cultural resources that may be discovered during site preparation or implementation of the Project.

AIIB ESP (2019) defines a Chance Find procedure as follows:

A chance find procedure is a "Project-specific procedure which will be followed if previously unknown cultural resources are encountered during Project activities." Such procedure generally includes a requirement to notify relevant authorities of found objects or sites by cultural resources experts; to close off the area of finds or sites to avoid further disturbance; to conduct an assessment of found objects or sites by cultural resources experts; to identify and implement actions consistent with the requirements of ESS 1 and national law; and to train Project workers on chance find procedures.

To comply with this requirements the following procedure has been developed:

Scope of the chance find procedure

This procedure is applicable to all activities conducted by the Project staff, including contractors, that have the potential to uncover a heritage item/site. The procedure details the actions to be taken when a previously unidentified and potential heritage item/site is found during construction activities. Procedure outlines the roles and responsibilities and the response times required from both project staff, and any relevant heritage authority.

Induction/Training:

All personnel, especially those working on earth movements and excavations, are to be inducted on the identification of potential heritage items/sites and the relevant actions for them with regards to this procedure during the Project induction and regular toolbox talks.

Chance find procedure steps:

If any person discovers a physical cultural resource, such as (but not limited to) archaeological sites, historical sites, remains and objects, or a cemetery and/or individual graves during excavation or construction, the following steps shall be taken:

1. Stop all works in the vicinity of the find, until a solution is found for the preservation of these artefacts, or advice from the relevant authorities is obtained;

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2. Immediately notify a foreman. The foreman will then notify the Construction Manager and the CSC/PIURR Environment/Social/Safety Specialist
3. Record details in Incident Report and take photos of the find;
4. Delineate the discovered site or area; secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities take over;
5. Preliminary evaluation of the findings by archaeologists. The archaeologist must make a rapid
assessment of the site or find to determine its importance. Based on this assessment the appropriate strategy can be implemented. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage such as aesthetic, historic, scientific or research, social and economic values of the find;
6. Sites of minor significance (such as isolated or unclear features, and isolated finds) should be recorded immediately by the archaeologist, thus causing a minimum disruption to the work schedule of the Contractor. The results of all archaeological work must be reported to the Ministry of Culture/Archaeological Institute, once completed.
7. Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage;

Construction works could resume only after permission is granted from the responsible authorities.
One of the main requirements of the procedure is record keeping. All finds must be registered. Photolog, copies of communication with decision making authorities, conclusions and recommendations/guidance, implementation reports will be kept.

Management options for archaeological site

Site avoidance. If the boundaries of the site have been delineated attempt must be made to redesign the proposed development to avoid the site. (The fastest and most cost effective management option)
• **Mitigation.** If it is not feasible to avoid the site through redesign, it will be necessary to sample it using data collection program prior to its loss. This could include surface collection and/or excavation. (The most expensive and time-consuming management option.)
• **Site Protection.** It may be possible to protect the site through the installation of barriers during the time of the development and/or possibly for a longer term. This could include the erection of high visibility fencing around the site or covering the site area with a geotextile and then capping it with fill. The exact prescription would be site- specific.

Management of replicable and non-replicable heritage
Different approaches for the finds apply to replicable and non-replicable heritage.
Replicable heritage
Where tangible cultural heritage that is replicable[20] and not critical is encountered, mitigation measures will be applied. The mitigation hierarchy is as follows:

- Avoidance;
- Minimization of adverse impacts and implementation of restoration measures, in situ;
- Restoration of the functionality of the cultural heritage, in a different location;
- Permanent removal of historical and archaeological artefacts and structures ;
- Compensation of loss - where minimization of adverse impacts and restoration not feasible.

Non-replicable heritage

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Most cultural heritage is best protected by in situ preservation, since removal is likely to result in irreparable damage or even destruction of the cultural heritage. Nonreplicable cultural heritage must not be removed unless all of the following conditions are met:

- There are no technically or financially feasible alternatives to removal;
- The overall benefits of the project conclusively outweigh the anticipated cultural heritage loss from removal; and replicable cultural heritage is defined as tangible forms of cultural heritage that can themselves be moved to another location or that can be replaced by a similar structure or natural features to which the cultural values can be transferred by appropriate measures.
- Archaeological or historical sites may be considered replicable where the particular eras and cultural values they represent are well represented by other sites and/or structures.

Nonreplicable cultural heritage may relate to the social, economic, cultural, environmental, and climatic conditions of past peoples, their evolving ecologies, adaptive strategies, and early forms of environmental management, where the

(i) cultural heritage is unique or relatively unique for the period it represents,
(ii) or cultural heritage is unique or relatively unique in linking several periods in the same site. Examples of non-replicable cultural heritage may include an ancient city or temple, or a site unique in the period that it represents.

Any removal of cultural heritage must be conducted using the best available technique advised by relevant authority and supervised by archaeologist.

Human Remains Management Options

The handling of archaeological human remains requires communication with local authorities, religious authorities, and influential elders as a first step.

There are two possible courses of action:

Avoid. The development project is redesigned to completely avoid the found remains. An assessment should be made as to whether the remains may be affected by residual or accumulative impacts associated with the development, and properly addressed by a comprehensive management plan.

Exhumate. Exhumation of the remains in a manner considered appropriate by local customs and traditions. This will involve predetermining a site suitable for the reburial of the remains. Certain ceremonies or procedures will need to be followed before development activities can commence in the area of discovery.

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Annex 8. Public Grievance Form

GRIEVANCE REGISTRATION FORM	
CONTACT INFORMATION	
Name:	Gender: □ Male / □ Female
Address:	
Community:	Telephone:
Jamoat:	E-mail:
Anonymous grievance: □ Yes / □ No	Preferred mode of communication for feedback: □ Mail / □ Phone / □ E-mail
DESCRIPTION OF GRIEVANCE / SUGGESTION / QUESTION	
Please provide details (who, what, where, when) of your grievance below:	
In case any other actions were undertaken by the complainant with respect to the grievance case, please provide details on past actions (if any):	
Please provide details on your suggested resolution for grievance:	
GRIEVANCE REGISTRATION DETAILS	
Name of registrant:	
Organization:	Position:
How the grievance was lodged: □ in person /	Type of grievance: □ type A / □ type B / □ type C

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□ mail / □ e-mail / □ phone / □ fax / □_____	
Documents attached:	Grievance is relevant to Project: □ Yes / □ No if "No" it was forwarded to: _____
Remarks:	
Signature of registrant:	Date of grievance: